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A Union Engineering Society House.

Our issue No. 33 mentioned the project of an engineers' building to be occupied jointly by the various engineering societies. At the present time when the house of the Mechanical Engineers has come to be inadequate in size, and when a project for an increase of dues to provide funds for sustaining a larger home is on foot, it seems fitting that attention should be directed to the advantages to be derived from a union building.

No one who is familiar with the facts can fail to be impressed with the great waste of the present plan. Except during the fall meeting, the house of the Mechanical Engineers is almost a solitude. A visitor will find perhaps a few (very few) readers in the library, and few out-of-town members make use of the sleeping rooms, and these, together with the office force of the society, comprise ordinarily the whole number of occupants. During the three or four days of the fall meeting the house is, on the other hand, thronged, and is, in fact, at that time altogether too small for its purpose. It was of course occupied during a few evenings of last winter by the now-given-up junior meetings, and a small revenue is derived from the rental of the audience hall and parlor for other meetings.

Substantially the same state of things exists in connection with the house of the Civil Engineers, in Fifty-seventh street, although the system of monthly meetings which that society adopts brings its house into more frequent use by the membership, and it is, we believe, somewhat more largely used in other ways than is the house of the Mechanical Engineers. The Mining Engineers maintain, through settled policy, a secretary's office only, and the Electrical Engineers do the same, though probably more from the necessity of economy than deliberate policy. The Society of Naval Architects and Marine Engineers occupies the house of the Mechanical Engineers as a tenant.

No one, and least of all an engineer, can regard such a state of things as satisfactory. The efficiency of the mechanism is altogether too low, and yet, notwithstanding this, the Mechanical Engineers are now asked to deliberately tax themselves to perpetuate the same conditions on a larger scale; for, when the new house is finished and occupied, the conditions of its use will in no wise differ from those of the present one.

The eminently proper and, indeed, the only sensible solution of the problem lies in a union society house with one large audience hall to be used by all, one union library (or perhaps we should say union of books, for the ownership should be kept separate), separate rooms for the officers and clerks of the different societies and a suitable number of sleeping rooms.

This plan does not contemplate any union of the societies, which is impracticable and probably undesirable. It simply contemplates an engineering building, adequate to the needs of all and worthy of the commanding position which the engineering profession has reached, which is to be occupied by the separate societies in the manner described. It is obvious that the needs of the societies would be far better met by such a building and at much less cost to each than by the present plan.

Not the least of the advantages of the plan lies in the possibility of a union library. It is well known that a very insignificant amount of money is spent on the Mechanical Engineers' library, because the society has but little to spend. Except as regards serials and periodicals it is not kept up, and most of these additions are, we believe, obtained through exchange for the Transactions.

At one of the meetings some years ago complaint was made of the inadequate expenditure for the library, and in explanation it was stated that the council considered it better policy to utilize the available funds of the society in cancelling the second mortgage bonds on its house rather than in buying books, and the hope was held out that when these bonds were paid off the library would receive adequate attention. The bonds are now cancelled, but the enlarged membership calls for increased accommodations, and should the society buy or build another house of its own, the result can hardly be other than the starvation of the library for another generation.

All this would be changed with the construction of a union building. A superior engineering library could soon be acquired which, under proper plans for the mail circulation of books, could be made available to all the membershop. It is not improbable that the economies of the plan might be so great as to enable the societies to engage in experimental research after the methods of some of the English societies.

The mining engineers, for reasons of their own, which they consider sufficient, do not wish a headquarters other than a secretary's office and their co-operation is not to be expected. The other societies, however, have nothing in their policies which are inimical to it. It stirs one's blood to think of the building which they could maintain and of the influence which it would exert on the engineering profession and on the estimation of the profession by the general public.

The most serious obstacle to the carrying out of the plan is of course the house of the Civil Engineers, which is almost new and which was built especially to suit their needs. In view of the possibility of a union building we have always looked upon the construction of that building as almost a crime, though who is responsibile for it we do not know. In view of its existence we believe that the best present solution of the problem which confronts the Mechanical Engineers would be for a time to use the Civil Engineers' building as a tenant. The plan of joint occupancy could thus be tested, and, if found to possess the advantages which we believe would attach to it, that building could at a later date be enlarged and the other societies be taken in with such change in the basis of ownership as would be feasible.

The plan may not be feasible, but it ought to be feasible. We do not know what obstacles there may be to carrying it out, but whatever they may be we do not believe they are due to the membership at large of any of the societies. We have

no doubt whatever that the membership bodies would cordially approve the plan were its advantages once pointed out to them. Official jealousies on the part of the management of one or more of the societies there may be (we do not mean to imply that there are), but it is the membership which is chiefly interested, which supplies the money and pays the bills and the membership should take the matter in hand.

The plan of a separate building for each society has nothing in its favor and everything in its disfavor. It is, in short, a folly which the members of the societies, as sensible men, should not countenance, much less uphold. We are opposed to the building of another house by the Mechanical Engineers until co-operation has been found to be impracticable. If the folly must be committed it should be because other societies refuse to co-operate and not because the Mechanical Engineers do not possess common sense.

The plan at present contemplated virtually asks the members of the American Society of Mechanical Engineers, scattered throughout the country, most of whom seldom, if ever, make any use of the building or have any opportunity of doing so, to go down into their pockets for ten additional dollars per annum, and for what? Why for the erection and maintenance of a building, not only not used directly by them, but to be used by no one except for about four days during the year, unless the society is fortunate enough to obtain tenants, and it is certain not to obtain enough of these to amount to very much. Official notice of the presentation of a resolution increasing the dues of members from $15 to $25 and of associates and juniors from $10 to $15 was given at the Milwaukee meeting, and we understand is to be voted upon at the fall meeting. We hope every member will be given the opportunity to vote upon it by mail or otherwise. There are a good many worthy members of the society to whom an increase of $10 per year in dues is of some importance, and we think most of them will at least want better evidence than is now available that there is some real necessity for the increase.

The Theory and Practice of Advertising.

In the successful management of a manufacturing business the thing of all most necessary to be done, often the most difficult thing, and sometimes the thing demanding the most intelligent and persistent effort, is the sale of the product when ready for the market, or, the same thing in another form, the securing of sufficient orders for goods to be made. No matter how excellent the product, or, after a time, how widely known, or how cheap the goods may be, they will not sell themselves. The more facile and prolific the means of production become the more pushing must the seller be. Demand for goods, although an expression so common in trade, by no means correctly characterizes the usual or ordinary attitude of the customer toward the producer. The latter is the one who usually does the demanding. Were it at all true that things are demanded then the customer would be the one to do the advertising; but the opposite is the almost universal mode of selling. The customer, or consumer, and not the producer, is the one to be sought out and informed, and generally solicited, and the producer must be the advertiser.

To be an advertiser one must first of all have something to tell, and which he very much wants the people to know; then he must see to it that the right people know, and that enough of them know. The writer hereof once personally assisted in the erection of a steam engine in a village in Lower Canada, as it was then called, and when the engine and machinery were all ready to run the proprietor had it cried on the church steps the following Sunday that he would be thereafter ready to grind the corn and card the wool for the parish. The announcement had all the elements of legitimate and successful advertising. The mill was ready and wanted work, and the customers were caught when they happened to be together, and were loudly told the fact, and no doubt the grain and the wool began to flow to the mill.

The advertiser always seeks a crowd, so that he may strike as many as possible at once. The difference in the cost and in the results between wholesale and retail practice is nowhere more pronounced than in advertising. It costs no more to address a thousand than to talk to a dozen, if you can catch them together. The full advantage of the wholesale method is only realized, however, in the appropriation of the modern opportunities. If all the readers of this journal could be at one time in one place no human voice could be heard by them all, yet the types and the cuts speak individually, and with full force and clearness to every one of them. Another and a greater opportunity is secured to the advertiser in the technical journal in the selection of the crowd addressed. Not only is the collection of auditors a modern marvel in its magnitude, but equally so is the sifting of the crowd, so that each is interested in the same special line and there are no mis-shots, although the crowd is so large.

The underlying facts of the modern advertising arrangements are not, after all, so different from those of old except in dimensions. Crowds are collected for any of the purposes for which multitudes assemble, and the seller cannot but see the opportunity, and jump at it, for exhibiting and discoursing upon his wares. The crowds collected are vast and are precisely the persons who must be, and almost the only persons who will be, the customers of the manufacturer in the given line. Not to address such a crowd is to neglect the supreme opportunity of business, and it is a marvel that any can do it. Neglect of advertising is scarcely more absurd than it would be to adopt positive means of concealment, as is done by counterfeiters and illicit distillers.

It is a strange thing that, modern advertising being what it is, there are still advertisers who regard the placing of advertisements as the bestowal of patronage. There are men of generally sound business practice who still do not adopt the strictly business view of the advertising department. They sometimes withdraw or threaten to withdraw advertisements, not because the crowd they may address is diminishing, or the character of it impaired, but because the trimming of the speaker's platform is not exactly to their taste or because one of the speakers makes a remark that is lame in its grammar or may possibly be wrong or erroneous. It is well to remember always that "business is business."

Take that travesty of justice enacted in the Court of Common Pleas of York, Pa. The presiding judge, himself one of the largest stockholders and a director of one of the chief iron and steel plants of the city, is called upon to restrain striking workmen, affiliated with his own employees, from prosecuting a strike undertaken to enforce an advance in wages. Under these circumstances could the judge and the employer of molders be made separate and distinct individualities in the interest of justice? Would he be human were the judge to decide against the manifest interests of the director of the foundry plant? Common decency might have prompted him to refer the case to a more unbiased court for adjudication, but he did not, and our members were fined and imprisoned.—"Iron Molders' Journal."

A Power Plant on the Eighth Floor of a Building.

Mr. E. J. Armstrong, of the Ball Engine Company, of Erie, Pa., sends us the following facts regarding a plant which was recently installed on the eighth floor of A. Booth & Co.'s cold storage house in Chicago:

"This machinery consists of two 150 horse-power Scotch boilers with economizers, feed pumps, forced draft apparatus and other accessories, several ammonia mixers and tanks, four motor driven brine and ammonia pumps, and, what is to us the interesting part of the installation, three 125 horse-power high-speed compound condensing Ball engines, direct connected to 75-kilowatt Crocker-Wheeler generators. These engines are 9x18x12 inches, running 275 revolutions per minute and we regard the placing of them on the eighth floor of a steel building as something of an innovation. In order to minimize vibration we

made them horizontal cross compound with cylinders as close together as possible. The cranks are at 180 degrees and the reciprocating parts of high and low pressure sides are equal in weight. The crank disks are weighted only to counterbalance the weight of connecting rod which comes upon the crank-pin. In other words, the vertical component of the inertia forces of the connecting rod is counterbalanced. These engines have recently been put in service and we are pleased to report that there is no vibration due to their operation perceptible in any part of the building. The total weight of the installation is about 300 tons."

A newspaper clipping sent us announces the projected erection of a tremendous plant to manufacture a steam turbine. This steam turbine must be a very remarkable thing as it is stated that Andrew Carnegie has organized a company in London with $4,000,000 capital to push it, and the newspaper reporter goes on to say that it "uses steam under 15 pounds pressure within a single cylinder the size of a nail keg." This is very remarkable and is something which so far as we know no other engine can possibly do, all others requiring cylinders very much larger than a nail keg in order to "use steam under 15 pounds pressure."

In the case of a temporary injunction issued against strikers in Boston, who had been employed by the American Tool Machine Company, the court decided that the peaceable efforts of the strikers made to prevent new employees from entering the employ of the company named were not unlawful, but that their efforts to persuade those who had already entered the employ of the company to leave or to break their contract with it were unlawful and they were permanently enjoined.

The total loss of the British torpedo boat destroyer "Viper" is much to be regretted, as it was the only naval vessel equipped with the Parsons turbine, and experiments with it were still in progress. The boat was wrecked off Alderney Island, on the southern coast of Great Britain, by striking the rocks and breaking in three pieces. Slowness in handling the engine and the lack of reverse power are considered to have contributed to the catastrophe.

The Militant Britisher on American Engines.

And now comes Fielden's "Militantly British" with an article on "American Engines in British Power Stations," and after telling a lot of things that we know are not so and a lot more of which it gives no proof and no clue by which an investigation might be set on foot, winds up as follows:

"Truly Power Station engines, like American locomotives, have been weighed in the balances and found wanting."

And still the perverse and purblind people will keep on buying them.

Commercial Review.

NEW YORK, Monday, August 19.

The first half of the present month has been a popular vacation time among the leading men at local machinery houses and trade observations are in consequence somewhat vague. The trend of trade seems to have been conservative, yet quite satisfactory for a midsummer month with good reason to hope that the fall will prove a better season than that of last year. Due regard, however, must be given to the steel strike which naturally arouses some apprehension in the trade. Stocks of machine tools have now to a considerable extent resumed their equilibrium after the strike of the machinists. Arrangements are said to be making for the shipment of 200 tons of machine tools to Antwerp.

A man connected with one of our most prominent machine tool manufacturing companies at its local office states that the market has a distinctly better tone than it had in August, 1900. The aggregate of sales is good and this aggregate is largely made up of small orders.

A detailed copy of the proposed German tariff schedule is now at hand and it may be seen just what the rates on machine tools amount to. Class 904 includes machines for working metal, wood or stone; steam and hydraulic forging presses, riveting machines and mechanical hammers (air drop hammers, dead-stroke hammers and other power hammers). The rates per 100 kilogrammes of net weight on this class are as follows: Up to 250 kilos, 20 marks; over 250 up to 1,000 kilos, 12 marks; over 1,000 up to 3,000 kilos, 8 marks; over 3,000 up to 10,000 kilos, 6 marks; over 10,000 kilos, 4 marks.

We print herewith a table giving the official returns of exports from the United States of machinery of domestic manufacture for the fiscal year ending June 30, 1901. It will be seen that the total, which is almost exactly $50,000,000, shows a falling off of 10 per cent. from that of the previous fiscal year, being midway between the totals for 1898-1899 and 1899-1900. For the year 1900-1901, as compared with 1899-1900, there is a decline of more than 40 per cent. in exports of metal-working machinery. An increase of over 30 per cent. is shown in electrical machinery and also in stationary steam engines. The increase in number of the latter exported is less than that of the valuation, indicating that the average size has been larger in the past year. Other gains for the year just closed are seen in cash registers, laundry machinery, fire engines and typewriters. Losses are noticeable in printing presses, pumps, sewing machines, shoe machinery, locomotives, boilers, etc., and in the general class, the falling off in the last mentioned amounting, fortunately, to only 5 per cent. It will be observed that shipments of pig iron have shown a gain for the year, but for the final month were only a small fraction of what they were a year earlier. A comparison of our machinery exports with those of the United Kingdom for the first half of this year, which are given below, shows that we have still abundant room for expansion in this direction before we shall rival Great Britain quantitatively, however well we may have already succeeded from a qualitative point of view.

Official returns of the exports of machinery from Great Britain and Ireland for the first six months of the current year compare with those for the corresponding

Machinery, Machines, and Parts of—	June—				Fiscal Year Ending June—					
	1900		1901		1899		1900		1901	
	Number.	Dollars.	Number.	Dollars.	Number.	Dollars.	Number.	Dollars.	Number.	Dollars.
Cash Registers	.....	57,884	29	1,700	.....	.....	.....	813,096	10,998	873,121
Electrical	.....	506,675	.....	456,591	.....	2,736,110	.....	4,340,992	.....	5,812,715
Laundry Machinery	.....	38,731	.....	44,868	.....	.....	.....	441,562	.....	479,274
Metal-working	.....	600,127	.....	182,573	.....	6,491,586	.....	7,193,300	.....	4,054,313
Printing Presses, and parts of	.....	118,987	.....	56,823	.....	847,266	.....	1,219,774	.....	1,005,929
Pumps and Pumping Machinery	.....	275,894	.....	97,140	.....	2,710,654	.....	3,112,525	.....	2,187,246
Sewing Machines, and parts of	.....	425,821	.....	257,894	.....	3,264,341	.....	4,541,774	.....	4,095,663
Shoe Machinery	.....	82,874	.....	74,058	.....	853,936	.....	1,163,265	.....	953,898
Steam Engines, and parts of—										
Fire	2	1,600	1	1,600	4	13,973	4	14,915	14	23,370
Locomotive	29	365,297	28	306,430	517	4,728,748	525	5,532,403	423	4,039,006
Stationary	129	94,059	90	44,345	605	335,061	1140	673,197	1246	901,888
Boilers and parts of Engines	.....	141,326	.....	145,046	.....	1,132,489	.....	1,767,856	.....	1,696,385
Typewriting Machines, and parts of	.....	215,845	.....	232,916	.....	2,440,205	.....	2,697,544	.....	2,827,329
All other Machinery, and parts of	.....	2,046,262	.....	1,509,263	.....	18,722,251	.....	21,913,202	.....	20,864,352
Total Machinery and parts of	.....	.....	.....	.....	.....	44,285,363	.....	55,485,465	.....	49,814,489
Pig Iron—	Tons		Tons		Tons		Tons		Tons	
Ferro-manganese	.....	.....	.....	.....	495	20,677	16	2,180	16	1,296
All other	16,673	338,949	2,616	41,881	299,146	3,340,628	160,674	3,122,573	255,217	3,763,287

UNITED STATES EXPORTS OF MACHINERY AND OF PIG IRON OF DOMESTIC MANUFACTURE, INCLUDING JUNE, 1901, AND THE FISCAL YEAR 1900-1901.

period last year as follows: Locomotives, 1901, £843,543; 1900, £773,043. Agricultural steam engines, 1901, £361,890; 1900, £407,116. Other steam engines, 1901, £853,933; 1900, £854,654. Agricultural machinery, not steam engines, 1901, £413,235; 1900, £539,098. Sewing machines, 1901, £760,136; 1900, £554,664. Mining machinery, 1901, £271,855; 1900, £288,011. Textile machinery, 1901, £2,517,770; 1900, £3,244,966. General machinery, 1901, £3,031,711; 1900, £3,184,553. Total of steam engines, machinery and mill work (ships not included), 1901, £9,054,073; 1900, £9,846,105.

It is announced that within a few days C. M. Schwab, president of the United States Steel Corporation, will assume control of the Bethlehem Steel Company, on which he secured a controlling option some months ago. The ultimate fate of the company is a matter of doubt. Besides an absorption by the United States Steel Corporation or by the Vickers-Cramp-Maxim interests one of the rumored ends to which it may be turned is a consolidation with some of the largest shipbuilding companies in the country outside of the Cramps. A probable enlargement of the works is also suggested, as their armor plate output capacity is now far under the demand.

News comes from Milwaukee that Federal Judge Seaman has signed a decree of foreclosure ordering the sale of the plants of the American Wood Working Machinery Company, at Green Bay, Wis., Williamsport and Montgomery, Pa., and Norwich, Conn. The foreclosure was on petition of the Farmers' Loan and Trust Company of New York, and involves $2,244,704. All parties have agreed to the public sale of the property, and Geo. L. Crawford, of New York, was appointed special master to conduct the sale.

A combination of steel-casting companies seems to be well-nigh assured. The capital is to be $15,000,000, and Daniel Egan, of Sharon, Pa., is to be president. It is said that among the concerns in the combination will be the Seaboard Steel Castings Company, the Solid Steel Casting Company, both of Chester, Pa.; American Steel Foundry Company and the Cullin & Gallagher Company, of St. Louis; the Sargent Company, of Chicago; the Franklin (Pa.) Steel Casting Company, the Pittsburgh Steel Casting Company and the Otis Steel Company, of Cleveland. The constituent companies will accept stock in payment for their plant.

The J. A. Fay & Egan Company, of Cincinnati, Ohio, is reported to have received an order for the woodworking machinery to be installed in the new shops of the National Tehuantepec Railway, Mexico. The company has also secured a contract for machinery to equip a sash, door and blind factory under construction at Puebla, Mexico.

An example of the locomotive works improvement boom is the decision of the Taunton (Mass.) Locomotive Manufacturing Company to build a new foundry, owing to the pressure of orders.

The American Locomotive Company has ordered for its Cooke works at Paterson, N. J., a 100 horse-power motor from the Sprague Electric Company. Among some other recent orders from engineering establishments booked by the Sprague company may be noted an 85 horse-power motor for the John Stephenson Company, Elizabeth, N. J.; a 75-kilowatt split-pole generator for the Chase Rolling Mill Company, Waterbury, Conn., and a quantity of motors for the mines and refining plant of the Arlington Copper Company, Arlington, N. J. The Sprague company is receiving many orders for its apparatus from all parts of the country and abroad.

The buoyancy of the electrical machinery market attested in our Chicago report this week is confirmed by a statement from the C & C Electric Company's office in this city. The company's trade has improved in the last month and they have at present more generators running from 25 to 150 kilowatts coming through their works than at any time in their history. The motor trade is also good.

CHICAGO MACHINERY MARKET.

The summer is one of the best ever known in the electrical machinery trade in the West. This is usually a time of activity for purchases for fall installations made in midsummer, but the demand in the aggregate is running ahead of anything previously experienced by many of the sellers. There is the usual amount of big business in sight, but the peculiar quality of current trade is perhaps a larger percentage of small orders than customary. The installation of electrical machinery is getting down to the rank and file of the manufacturing trade and for generators and motors running from 25 or 50 horsepower up there continues a brisk inquiry. Makers are not in position to make quick deliveries for large power and even the small r machines are slow in getting to destination because of the overcrowded condition of factories. Some little criticism is indulged in at the steel strike, which is holding back some orders and also because the factories are inconvenienced and sometimes delayed in work by the scarcity of steel sheets. However, this is only a minor note in the situation, for it is overshadowed by the general briskness of trade.

The Brown Corliss Engine Company, which will erect a plant at Western Union Crossing, near Milwaukee, Wis., has ordered from the Bullock Electric Manufacturing Company a complete equipment of motors aggregating several hundred horsepower. One of the largest industrial orders lately placed in the West was that of the Dow Chemical Company, Midland, Mich., which includes a 1,600-kilowatt Westinghouse generator and a 2,400 horsepower Allis vertical cross-compound engine.

Kilburn & Jacobs, Columbus, Ohio, have bought a General Electric three-phase apparatus, consisting of a 600 horse-power generator and 800 horse-power motors.

Among recent orders of the Crocker-Wheeler Company are the following: Page Woven Wire Fence Company, Adrian, Mich., 125 horse-power generator and a number of motors; Latrobe Steel Company, 300 horse-power generator for installation at Latrobe, Pa.; National Pneumatic Service Company, Chicago, 200 horse-power in motors; Twin City Iron Works, Minneapolis, Minn., 100 horsepower generator and motors; Pontiac Spring and Wagon Works, Pontiac, Mich., 50 horse-power generator; J. K. Farley, Chicago, 150-kilowatt generator. The Crocker-Wheeler Company has also just taken an order for the first electrically driven plant in the Philippine Islands, 50 motors for a government printing plant at Manila.

The C & C Electric Company has a very active summer trade. Among orders placed locally is one for motors aggregating 250 kilowatts from the Wm. J. Moxley Company.

The Eddy Electric Manufacturing Company report they have never known an August trade so active as this.

Quotations.

NEW YORK, Monday, Aug. 19.

Pennsylvania Foundry Pig Irons, Jersey City delivery:

No. 1 X	$15 15 @ $15 50
No. 2 X	14 65 @ 15 15
No. 2 plain	14 15 @ 14 65
Gray forge	13 75 @ 14 25

Alabama Pig, New York delivery:

No. 1 foundry, or soft	14 75 @ 15 00
No. 2 foundry, or soft	14 00 @ 14 25
No. 3 foundry	13 50 @ 13 75
Foundry forge, or No. 4	13 00 @ 13 25

Bar Iron—Base sizes—Refined brands, mill prices on dock, 1.58c.; from store, 1.85 @ 1.90c.

Tool Steel—Base sizes—Good standard quality, 7c.; extra grades, 10c. and upward.

Machinery Steel—Base sizes—Advanced to 2.00c. regular price.

Cold Rolled Steel Shafting—Base sizes—From store, 2½ @ 2¾c.

Copper—Lake Superior ingot, 16½ @ 17c.; electrolytic, 16⅜ @ 16⅝c.; casting, irregular, 15¾ @ 16⅝c.

Pig Tin—26¾c. spot for 5 and 10-ton lots, f. o. b.

Pig Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—3.90 @ 4.00c., New York.

Antimony—Cookson's, 10¼ @ 10⅜c.; Hallett's, 8½c.; Hungarian, 8¼ @ 8⅜c.

Lard Oil—Prime City, 68 @ 70c. for jobbing lots.

Proposed Regulations for the Safety of Workmen in Belgium.

A law intended to secure the health and safety of workmen has been submitted by the Belgian Government by advice of sections of the councils of industry and labor. A resumé of some of its provisions may be of interest as showing the precautions that may be taken, and which in the opinion of prominent engineers and other authorities ought to be taken to obviate the risks from dangerous machinery and materials. Two sets of such rules, formulated it appears as alternatives, are under consideration. Among the provisions of the first are the following:

Those parts of the machinery that are in rapid rotation are to be so enclosed that in case of rupture no personal harm may result. No workman shall be kept in front of a flywheel or other part turning at high velocity. There shall be guards, such as gratings from flying pieces of materials used in the work. Protective eye-goggles shall be furnished where necessary. Suitable precautions shall be taken against the effects of corrosive, burning or poisonous substances. Special arrangements shall be made to prevent as far as possible the projection of fragments of these materials and the injurious effects if workmen are struck by them. A society formed in Belgium to favor the diffusion and perfection of such appliances possesses the plans of those which the government has especially in mind.

Hoists, elevating apparatus, cranes, etc., should be marked with their lifting power, and, if intended to carry people, with the number of persons they will safely sustain. They are to be furnished with brakes, stop ratchets, parachutes or other safety devices; their gearing and transmissions shall be enclosed or otherwise safeguarded so as to avoid danger. Precautions shall be taken to prevent the fall of their loads either in whole or in part. The owners or their representatives shall frequently test the apparatus with its chains, ropes, cables, etc. Every piece judged of doubtful soundness shall immediately be removed. Dangerous elevator shafts shall be suitably guarded to prevent people falling through.

Fire pits are to be covered or solidly railed in. Stair cases are to be strong and with sufficiently high rails. Movable steps and ladders shall be solid, sufficiently long, with not a missing or defective step or rung, and provided against slipping. Passageways, galleries, etc., shall be firm, with sufficiently high railings, and precautions shall be taken to avoid vibrations.

Suitable arrangements are to be made to avoid danger in working or transporting heavy, large or dangerous objects. No one is allowed to carry in his arms a load that shuts off his field of view. Special means are to be taken in transporting corrosive, burning or poisonous substances.

A special chapter is devoted to precautions against fire. Ample exits are to be provided and kept unencumbered. Doors shall open outwardly. Staircases, passages and galleries shall be sufficiently numerous and constructed, as far as possible, of incombustible materials.

The light in the places of work shall be strong enough to distinguish the power-transmitting and other machinery. Stairs, passages, courts, etc., shall be well enough lighted to avoid danger in going through them. When lamps burning any sort of mineral oil are used measures shall be taken to avoid explosion and the use of such oil is forbidden in the portable lamps called "crassets" or other dangerous appliances. Careful maintenance and inspection shall be given to gas-lighting apparatus and all desirable precautions shall be taken in the use of electricity.

There shall be a prohibition against taking naps in proximity to boilers, furnaces, engines, etc.

The law concerns itself not only with the obligations of employers to ensure the safety of their men, but the duties of the latter to the same end. Men working in particularly unhealthful places shall wear special clothes for their work, which they shall change upon leaving it. They are forbidden to enter pits, cisterns, reservoirs, etc., which might contain dangerous gases, until these have been ventilated. Neither must they enter without having a rope attached to them, so that they may be drawn out if need be.

Workmen are not to enter places where there is motive machinery, except for reasons connected with the work. They are forbidden to start a gas engine by applying force under an arm of the flywheel. When the machinery is in motion they are forbidden to touch or repair transmission cables, chains or belts while in place, or to put on or shift a belt directly by hand.

The last-mentioned prohibitions apply to the employers as well as to the men; so, for the most part, do the following:

The men are forbidden to remove safety appliances on their own authority; to clean or repair while in motion machinery or transmission apparatus having parts liable to cause accidents; to tighten keys, nuts, screws, etc., on parts not completely at rest; to lubricate in dangerous places otherwise than by means of duly safe appliances; to change or lay down clothing in proximity to moving machinery; to wear clothing flying loose in such cases or to leave the head unprotected against entanglement of the hair in the machinery; to work in places where there is danger of flying splinters, etc., without wearing goggles; to pass beneath suspended loads; to use, under any pretext, lamps other than safety ones where there may be inflammable gases; to sleep or repose in dangerous or unhealthy places.

Exceptions to the prescribed rules may be authorized by a special deputation, with the advice of the inspector of work. Employers are to take measures to secure prompt medical assistance for their injured workmen. In the cases of death from accident or injuries which may cause eight days' incapacity, notice must be given to the inspector of work. Penalties are provided for infractions of the rules.

There has been formulated another set of regulations analogous to the foregoing and embodying in particular the views of the society founded to promote safety appliances for workmen. Some features of the latter code are prescriptions as to labor in earth works, mines, caissons, roofs, steeples, scaffoldings, etc.

Whatever action upon the various rules suggested be finally taken by the Belgian Government, they contain suggestions which might be found useful in other jurisdictions.

Hydraulic Intensifiers.

BY GERALD E. FLANAGAN.

To the minds of many persons the operation of hydraulic intensifiers seems to be shrouded in the most profound mystery and obscurity, and yet these very same people, when once they give the matter sufficient attention to understand the principle involved, are led to wonder why it was they required to have so simple a contrivance explained to them. The intensifier bears exactly the same relation to hydraulic that the transformer does to electrical transmission, and it is just as much of a bugaboo to the uninitiated, but it is much more readily understood by one who has had no previous acquaintance with either device. Just as in the step-up electrical transformers, current is received in large quantity and low pressure and delivered in smaller quantity at higher pressure, so the hydraulic intensifier takes water at low pressure and large volume and returns water at higher pressure, but less of it, the product of the pressure multiplied by the volume as delivered being the same as that on the receiving side, less an amount representing the work done in overcoming the friction of the machine. What becomes of the surplus water and how does it happen that its pressure is increased? The answer is simple. A hydraulic intensifier is a pump, neither more nor less. In place of receiving steam under pressure at the large end and pushing out water under still greater pressure at the small end, it simply receives water in place of steam in the large cylinder, and, as in the case of a steam pump, delivers high-pressure water from the small cylinder, but the water delivered is not the same as that received, any more than the water delivered by the pump is the condensation from the steam cylinder of the same.

In an ordinary hydraulic system the pump receives water from a tank and forces it into the mains at the required pressure; after doing work in the various machines it returns to the tank and the office of the pump is to keep it circulating.

The operation of the intensifier is but slightly different. Usually it is connected directly to the machine it is designed to operate, and it is so proportioned that one stroke of the intensifier will displace water sufficient for the required stroke of the machine cylinder, since the water passes repeatedly backwards and forwards from the one to the other.

In the case of shears, presses and other tools which are required to exert a maximum pressure for only a small portion of their stroke the connections are so made that water under ordinary pressure from the main operates the machine until the point of the stroke is reached, which calls for a sudden and great accession of force, the intensifier then comes into play and, by its multiplying action, develops force sufficient to overcome the resistance which the shear or press has met with at this point, and so the stroke is completed. The valves which determine these movements can be arranged to be controlled by hand, and the additional pressure to be thrown on by the shear-man whenever it is seen to be necessary, or they can be designed to be operated automatically by the movements of the machine.

Since the usual pressure of hydraulic systems is from 400 to 800 pounds, while there are many tools which cannot well be designed to work under a pressure less than from 1,500 pounds to 3,000 pounds, the hydraulic intensifier provides a convenient link between the line and such a tool, obviating the necessity of installing a separate high-pressure system. The pressure required by a tool depends upon the work it is to do, and this, in many instances, varies from week to week or day to day, or even in much shorter periods. Where this variation is extreme the intensifier is made with several intermediate cylinders, producing as many different degrees of pressure.

Fig. 1 shows in diagrammatic form an intensifier as usually arranged in connection with the cylinder of a shear, press or other hydraulic tool. The small cylinder shown above the large one is for the purpose of returning the plunger of the tool and displacing the water from the large cylinder, which must be done at times against a head of thirty or forty feet and the friction of several hundred feet of pipe, leading back to the same tank from which the pressure pumps received it in the first instance. When the intensifier is used this water is returned, not into the waste water tank, but back into the small cylinder of the intensifier, and the water which, in turn, is ejected from the large cylinder of the intensifier goes back to the tank. It will be seen that the water between the intensifier and the tool cylinder is merely a link between the two and is used repeatedly. It will also be noticed that when the tool is operated directly from the main the volume of water used is exactly that of its operating cylinder; but when the intensifier is used this volume is increased in the proportion which the small cylinder of the intensifier bears to the large one. From this it follows that the power developed by this apparatus is not mysteriously evolved from nothing, but is merely the result of increased pump action somewhere on the line. The balancing cylinder is connected

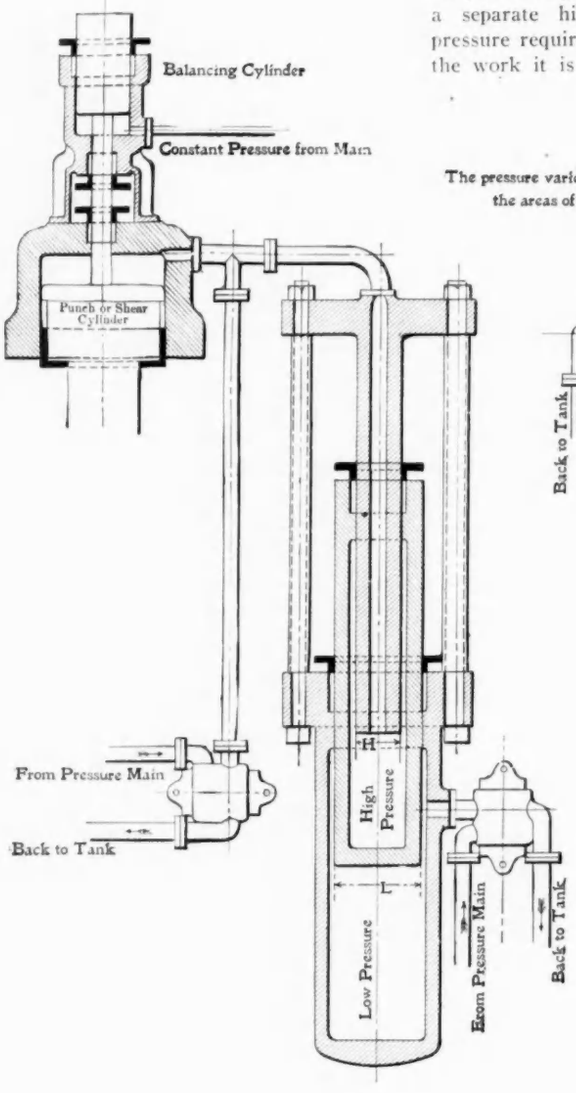


Fig. 1

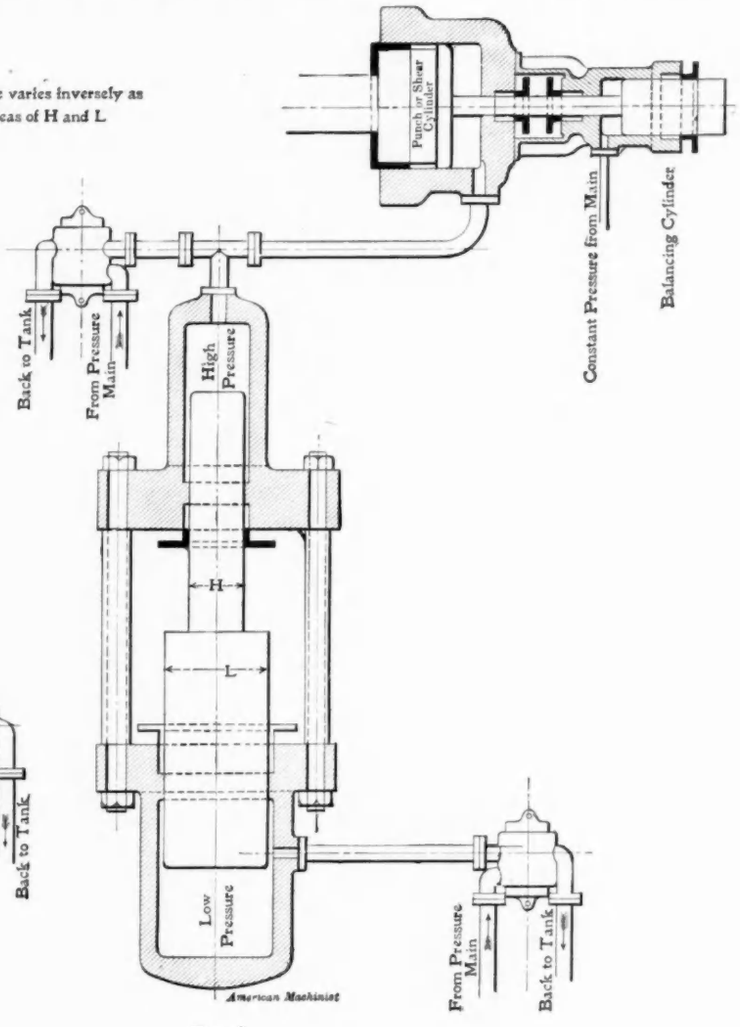


Fig. 2

HYDRAULIC INTENSIFIERS.

directly to the pressure line and the main cylinder must be sufficiently large to overcome this force and do its own work in addition. The action is exactly the same as if the balancing cylinder were replaced by a spring or a counterweight, and the work done against it is not lost but is returned by the expulsion of the water from the main cylinder as above noted. As shown in the figure, there is a separate valve for operating the tool direct from main, and one for operating the intensifier. In practice these valves are often combined in one, having the outward semblance of a single valve.

Fig. 2 shows a modified form of intensifier from which the resemblance to a pump actuated by hydraulic pressure will be at once apparent.

The Abuse of Formulas—Comparative Machine Design.

I recently saw a gear formula, and, granting all the assumptions which the writer of it makes, the formula is theoretically correct; but it works out in practice that unless the breadth of face is greater than about one and one-half times the pitch, the gear will break easier when the load is uniformly distributed along the face than when it is concentrated on one corner of the tooth. Gears frequently occur, especially in agricultural machinery, where the breadth of face is less than this amount. According to the formula such gears will transmit more power with safety if the shafts are a little out of parallel than if the gears run true. This seems to be a great discovery. Think of it! By simply skewing the shafts a little bit we may be able to lessen the weight of gearing in the next flying machine enough to make it sail like a kite. But to go back to the case in hand, which is an actual one as I can easily prove, it simply serves to show that you can't even design a formula on unsound principles or uncertain assumptions and expect it to work well. Much less can a machine be designed on unsound formulas. The trouble with so many so-called empirical rules and formulas for proportioning machine parts is, first, assumptions are made for the sake of simplicity in deriving them, which are not sufficiently tenable to admit of more than a very narrow range of application of the formula, and again, constant factors are used that depend on somebody's experience under particular conditions, and which would not be the same under other conditions. My object in pointing this out is not to show of how little value are formulas in machine design, but of how much—if properly understood and handled—and to get at the rationale of the subject as far as possible.

Taking the case in hand; some formulas for the strength of gears are derived on the assumption that the strain is entirely taken by one tooth; others, that it is distributed on two teeth; some consider the strain as acting on the corner of the tooth, others as uniformly distributed along the face; some assume that the tooth is a cantilever of uniform cross-section, others that it is wedge-shaped. Most of these assumptions are perhaps tenable, but none of them are strictly exact. Three of them are embodied in almost every formula for the strength of gears. A little reflection will show that there are eight different ways in which they may be combined, and the results given by the formulas derived in each of these eight ways will be widely different. Is it any wonder, then, that different formulas now in use give the horse-power of a spur gear all the way from one to three times the least value? It seems as if the only satisfactory solution to this problem and others of a similar nature would be some sort of a hydra-headed formula in which everyone could substitute his own pet assumptions.

I have seen a half dozen different formulas for the thickness of a steam engine cylinder, all worked out in accordance with the same mechanical principles, but differing widely in the results they gave, simply because the engineers who derived them each clipped, as it were, his own formula to fit his experience in the matter. Such formulas are little more than condensed expressions for someone's experience in designing, and, in general, the wider and more general the experience on which they are based the more reliable they will be. This is where Unwin and Kent hold the supremacy. Their books are both full of formulas backed by wide experience. Nevertheless, there are limitations to the application even of their rules, and in all cases the results they give must be checked by good critical judgment. In this respect the old engineer has the advantage over every beginner, whatever may be the latter's superiority in theoretical training. For, if he has had his eyes open, he has in mind a fund of ideas and impressions regarding the size or proportions of something of the same sort which he has seen before, and knows at once very nearly what its dimensions should be. It is not guesswork if he tells the young draftsman to increase the size of the crank shaft of his engine 25 per cent. over what he found by the formula for its diameter. It is simply exercising what artists call the "faculty of proportion." It seems to me that our technical schools can do no better work for the engineer of the future than to thoroughly and systematically develop this faculty at an early period in life, so that the engineer shall, as far as possible, have the use of it right along and not have to wait for the full possession of it until he is old and ready to be superannuated. To my mind, a good way to cultivate that good judgment of proportion in machinery, so useful to the designer, is by a careful comparative study of the proportions of machines as found in practice. Would it not be a good plan to let technical students coming from the shops receive credit, as far as practicable, for their shop work, as advocated by the "American Machinist," and then spend the time saved visiting shops for this purpose? Let each one measure for himself all the leading dimensions of several different machines of the same class. The results may be tabulated for reference; or better, in many cases they may be plotted and very valuable conclusions drawn from them. This is work that can be done by almost anyone, and its advantages to the student are obvious. I do not advocate this as anything new, for I know it is not; but I think few technical schools give this class of work as much attention as it deserves. Why does not someone found a chair of comparative machine design in some of them? SPIRAL.

[Our contributor is a little at sea over the meaning of the comparative strength of a gear tooth when loaded at one corner and along its edge. A long tooth will break if loaded on the corner under a smaller load than if loaded uniformly along its edge, because in the former case it will break cornerwise. If the tooth be shortened a point is finally reached where the superior strength due to the uniform loading disappears. Such a tooth will break as a whole and not across the corner, no matter whether loaded on the corner or uniformly along the edge. In any case the tooth will break on its weakest section and with the load due to the strength of that section. The formula tells which is the weakest section and where the tooth will break. The fact that the tooth has a stronger section does not strengthen the tooth any more than one extra strong link strengthens a chain, and the formula does not indicate that it does.—Ed.]

A Screw Milling Machine.

Our illustrations show machines designed and most successfully employed for cutting screw threads entirely by the use of milling cutters. This system of screw cutting is not an absolute novelty, as it has already gone into permanent and highly satisfactory employment in more than a score of the most prominent engineering concerns of Great Britain, Germany and France, and it is now hoped that the American rights may be disposed of to some enterprising firm. This machine, or rather, system, is one of the most interesting exhibits of the current Glasgow exhibition. The inventor is Mr. H. Liebert, managing director of John Holroyd & Co., engineers and toolmakers, Perseverance Works, Milnrow, near Rochdale, Lancashire, England.

The machine shown in Fig. 1 is designated by the makers as their No. 2 machine. It cuts single, double, triple or other multiple threads, right hand or left hand, and square, V or of other shape, on screws of any length from ⅜ to 1⅞ inches diameter, and worms not exceeding 2½ inches diameter and 26 inches long, in

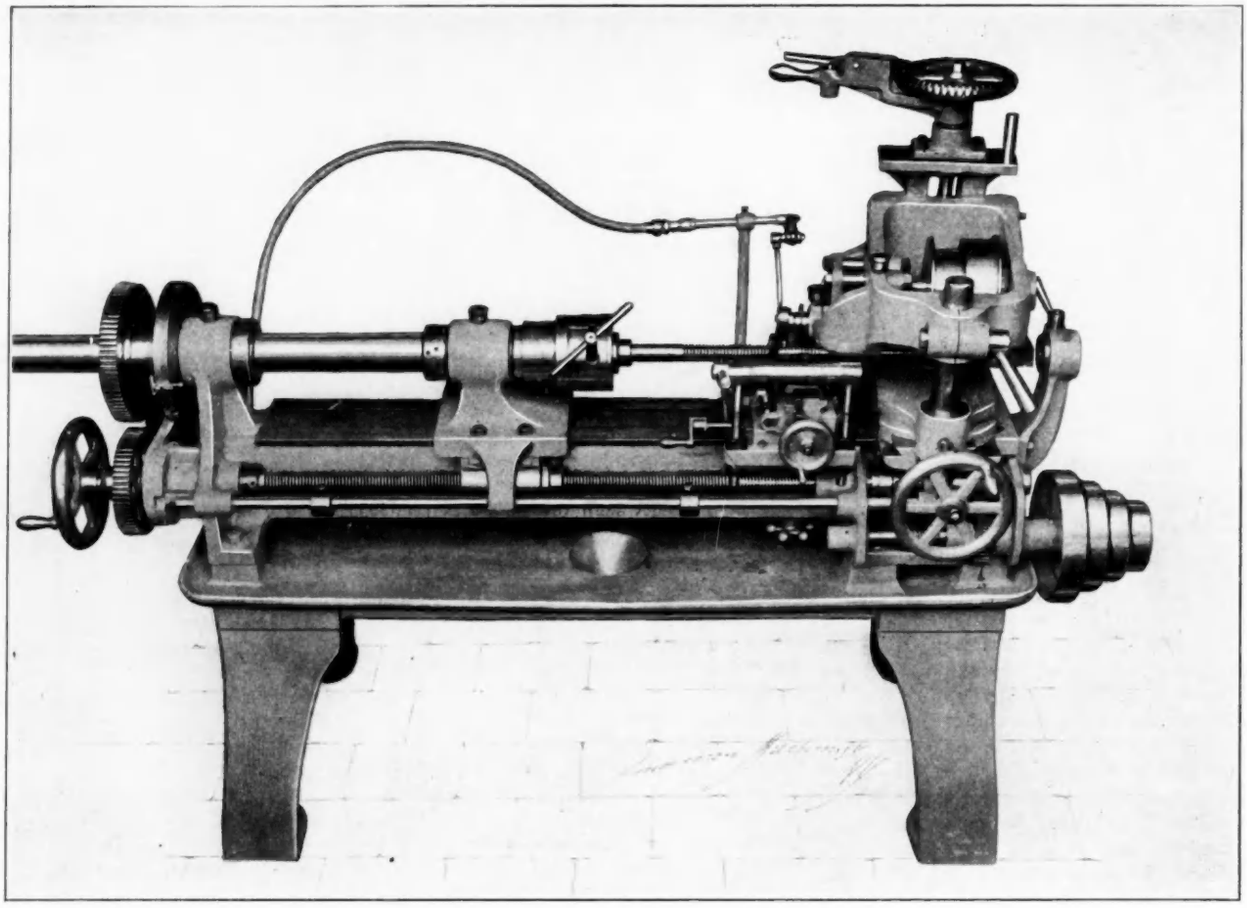


FIG. 1. A SCREW MILLING MACHINE.

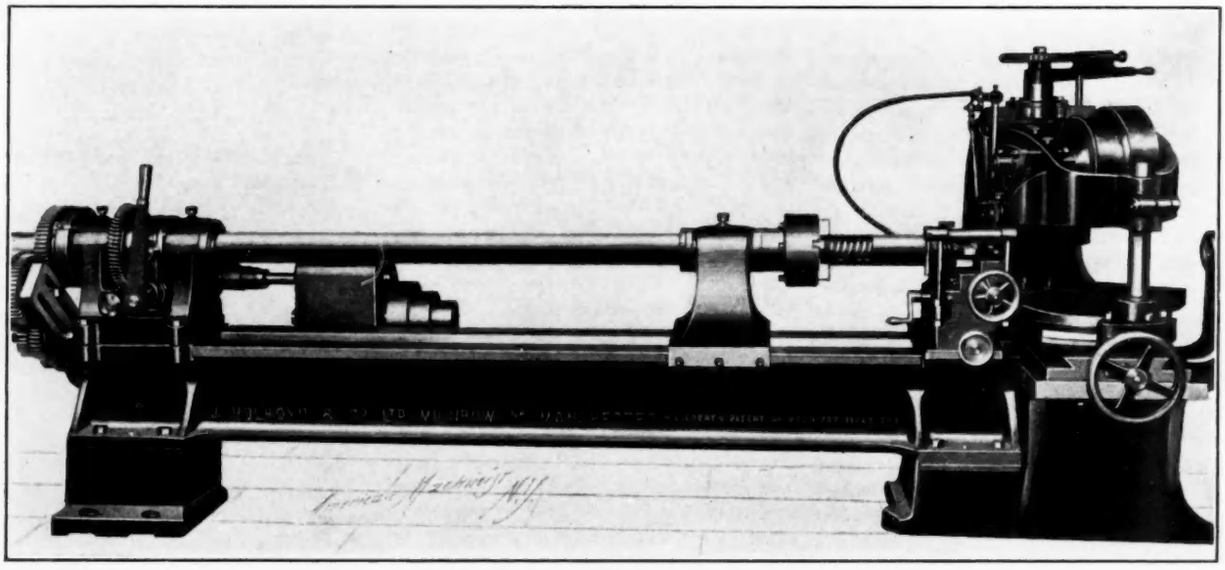


FIG. 2. SCREW MILLING MACHINE FOR LARGE WORK.

pitches from 2 to 10 to the inch. The right-hand end may be considered the head of the machine. This carries the cutter, the spindle of which is geared directly to the shaft which carries the two-step cone by which the cutter is driven. The cutter head is swiveled horizontally to give the cutter the angle corresponding to the pitch of the thread; it is adjustable vertically for the depth of the thread, and also horizontally to bring the cutter correctly over the center of the screw to be cut. When the cutter is correctly set its position does not change, the work being rotated and fed along under it.

The screw to be cut is slipped in through the hollow spindle from the left-hand end and is secured in the chuck with a portion of it projecting to the right, upon which the thread is to be cut. A bearing is provided immediately under the milling cutter, with also a bar above to prevent the screw from lifting or dodging. The four-step cone at the right does the driving of the work and also of the feed screw, change gears being provided for giving the correct relative movements of rotation. As

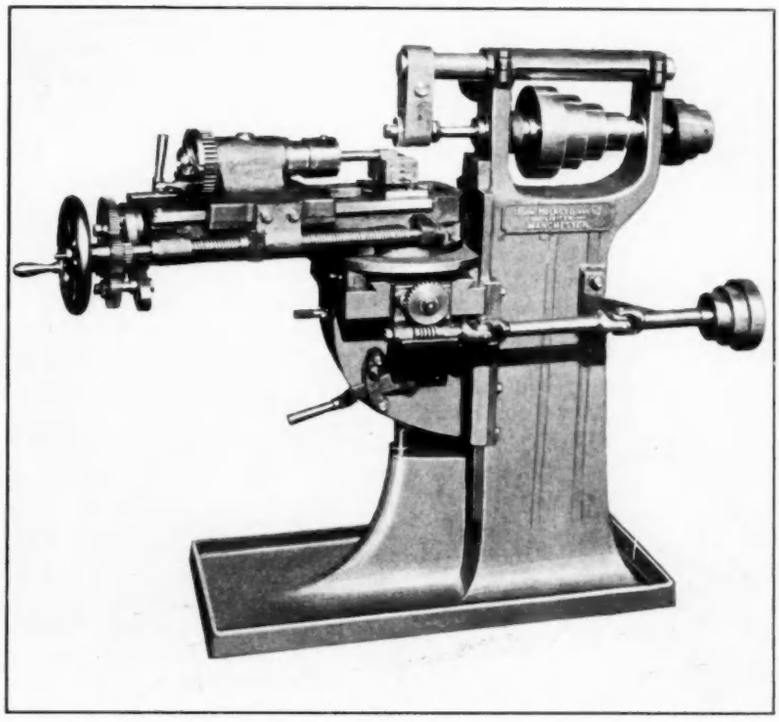


FIG. 3. MACHINE FOR MILLING SMALL SCREWS.

Fig. 3 shows the machine called No. 1 by the builders. This is for milling single or multiple threads, right or left, on valve stems or similar articles of brass, iron or steel up to 6 inches in length of thread and 1 inch in diameter. This is an ordinary upright milling machine with an overhanging arm which may be adjusted in or out to keep the bearing close to the milling cutter. All the mechanism required for

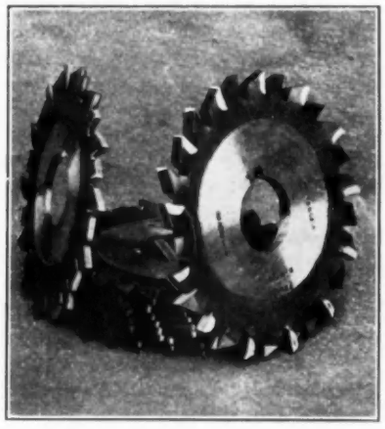


FIG. 4. A GROUP OF MILLING CUTTERS.

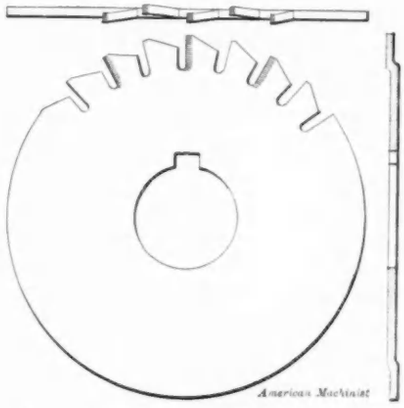


FIG. 5. PUNCHED AND STAMPED MILLING CUTTER.

the splined hollow spindle rotates, the carriage at the chuck end is moved along by the lead screw and the milling cutter does its work, usually completing it at a single operation. If a long screw is to be cut, the work begins with the carriage as far back to the left as it can conveniently go, and when, in the operation of cutting the thread, the chuck has advanced nearly up to the cutter, the end of the completed portion of the screw will have entered the hub in the bracket at the right. The machine is then stopped, this end of the screw is clamped by tightening the split bushing, the chuck is slackened, the carriage is run quickly back, the chuck is tightened again and the screw-cutting operation is resumed for another length of the screw, and so on. Automatic stops are provided for the carriage when cutting either right hand or left hand, and there is a quick movement for lifting the cutter out of the thread without disturbing its adjustment. The dividing for multiple threads is done by the disk at the back end of the hollow spindle. Indexes are provided for all the adjustments of the cutter head.

Fig. 2 shows a larger and somewhat differently arranged machine. This cuts screws of any length from 1 to 2½ inches diameter and worms up to 5 inches diameter and 4 feet long, with pitches from 6 to ¼ threads to the inch. The cone by which the spindle and the lead screw are driven is in this case at the back of the machine and toward the left-hand end of it. The work shows a portion of it projecting from the chuck with a triple or quadruple left-hand thread cut upon it, while the position of the cutter shows that a right-hand thread is to be cut upon the end of it.

setting the work in the right position relatively to the cutter and for feeding it under the cut is carried by the knee slide and table. The work is held in the chuck with the portion to be threaded projecting and with a support immediately under the cutter, in which it can turn and advance without yielding. It is not necessary to describe the details of construction or operation. This also, of course, readily cuts double, triple or other multiple threads as required. When one thread groove is cut a spring pin is pulled out and the hollow spindle is turned to the position for the next groove, when the pin snaps into place and the work proceeds.

In connection with these machines a novel milling cutter is employed, the novelty, however, being more in the making of it

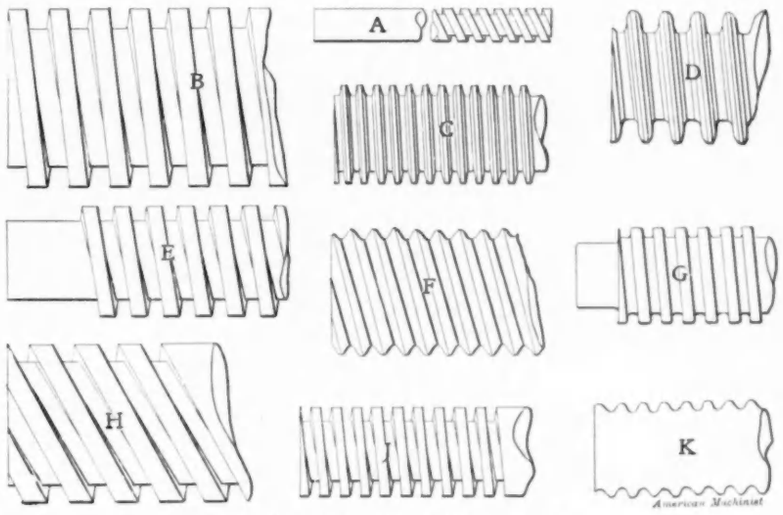


FIG. 6. SAMPLES OF MILLED SCREWS.

than in the cutter produced. A group of the finished cutters is shown in the half-tone, Fig. 4, and the drawing, Fig. 5, shows the make of the single cutter. As will be seen, it is cheaply produced, being punched and stamped from sheet steel of the required thickness, the subsequent operations consisting mostly of grinding. The finished cutters are excellent in appearance and in fact. Ample clearance is secured for the teeth, which prolongs the life of the cutter. In cutting square threads a constant width of groove is assured after repeated grindings. As a sample of the endurance of the cutters it is stated that thirty screws, 1 inch in diameter, 6 inches long, four threads to the inch, were cut without grinding the cutter, the last screw fitting the nut as accurately as the first.

To give an idea of the speed at which screws are cut by this system, the outlines of several different styles of screws are grouped in Fig. 6, and below we give the dimensions of each, with the time required to cut 1 foot in length. In comparing these times with that of a skilled machinist on a regular engine lathe it is to be remembered that this machine is automatic and that several can be kept constantly running by one man.

The dimensions and other necessary particulars as to the cutting of these screws are as follows:

A—Diameter, ½ inch; pitch, ½ inch, double thread; time required to mill 12 inches, 10 minutes.

B—Diameter, 2¾ inches; pitch ⅝ inch, single thread; length, 17¾ inches; time required to mill, 45 minutes.

C—Diameter, 1½ inches; pitch, ¼ inch; time to mill 12 inches, 40 minutes.

D—Diameter, 2 inches; pitch, ½ inch; time required to mill 12 inches, 90 minutes, in three cuts.

E—Diameter, 1¾ inches; pitch, ½ inch; time required to mill 12 inches, 20 minutes.

F—Diameter, 2 inches; pitch, 1 inch, triple thread; length, 18¼ inches; time required to mill this length, 1 hour.

G—Diameter, 1½ inches; pitch, ⅓ inch; length, 10 inches; time required to mill this length, 15 minutes.

H—Diameter, 2½ inches; pitch, 3 inches, triple thread; grooves, ⅓x⅓ inch; time required to mill 12 inches, 55 minutes.

J—Diameter, 1⅜ inch; pitch 5-16 inch; grooves, 5-32 inch wide and 5-16 inch deep; time required to mill 12 inches, 27 minutes.

K—Diameter, 1½ inches; pitch, ⅓ inch; cut at the rate of 6 inches in circumference per minute.

When the machine was designed it was made with the idea that it would be good only for rough and cheap work, but after a few trials it proved itself accurate and reliable for quite a high grade of product. Inaccuracies arising from torsion or from the heating of the work while being cut are almost entirely eliminated. The lubricant with which the cutter is flooded keeps it constantly cool.

How to Reduce Foundry Costs.*

To the makers of molding machines we are greatly indebted for the reduction in the cost of castings, as well as for the increase in production. Now, we will take the means they use to make their machines a success and apply them on work that is to be done by hand and see if we cannot arrive at almost the same results. Every maker of molding machines claims that in order to get the greatest benefit from a machine, the patterns and core boxes must be perfect. Would it not be well for foundrymen to follow this example on all patterns sent to the foundry? If it is profitable to spend money on a machine pattern so that when it leaves the mold there is no further work to be done, would it not be much more so to have all patterns properly constructed, and thus reduce as much as possible the skill that is required in hand molding?

I do not mean that a patternmaker should spend as much time on a pattern from which you want to get only one casting, as he would on patterns that are to be used continuously; it is our standard hand patterns that we want made as well as our machine patterns. Let us assume that the cost of work now done by machines is as low as can be made possible; then we will turn our attention to the patterns which are not considered practical to be used on machines. Some of the patterns are so large and complicated that it would require the services of a skilled molder to do the work; the remainder is ordered in such small quantities that it would not pay to have the patterns fitted up for machines. It is to these classes of work that the foundryman must turn his attention in order to make a still further reduction in the cost of castings.

Let us take the work that is considered too complicated for machines. When these patterns were made was the best and cheapest way to mold them thought of, or did the patternmaker make the pattern the easiest way for himself, without thinking of what it would cost in the foundry? It is safe to say that in nine out of ten times the requirements of the foundry were not considered, and in consequence the cost of the molding was nearly doubled. This could have been avoided had the foundry foreman been consulted, and the chances would have been that the castings could have been made at a minimum cost.

A short time ago a pattern for a large bed of a pumping engine was sent to a foundry for five castings, each of which would weigh several tons. The foreman objected to the way the pattern was made, as he claimed it could be molded much cheaper if constructed in a different manner. After many arguments he was told to make one casting the way the pattern was made, then if he wished to have it changed, it would be done. It took a molder and a helper seven days to make the casting. The pattern was then changed and the same men made it in four days. The cost for molding the first casting was $31.50, while the last four were made at $18, a gain of $13.50 a piece.

Another pattern which had been used a long time, and from which hundreds of castings had been made, took a molder, working at the rate of $2.50 per day, a day's time to make sixteen castings. The molder, working at this rate, would make the castings cost a little less than 16 cents each. This pattern was changed at a cost of $3.50 and then a laborer made one hundred castings for $1.25; the cores cost 75 cents, making the castings cost 2 cents each. This work was not done on a machine. If it had been, would not the machine makers claim that the machine was the cause of this reduction? I could cite hundreds of cases similar to these, where by making a few alterations on a pattern the expense of molding was cut in half.

If our machine shop costs are greater than we think they should be, we lose no time to look for new and more modern tools with which to do the work. If our foundry expenses are high, are we not inclined to think that the foreman has been neglecting his business? Has it ever occurred to you that you are to blame for the increased cost? Are you not asking your foreman to turn out good work with poor patterns and flasks? Are you doing anything to help him to reduce the cost, or are you not asking him to do work that belongs to the pattern shop? The molder has to do this work every time a casting is made from a poor pattern. Had the patternmaker done his work properly, there would have been no occasion for this extra molder's work.

Give the same attention to your foundry that you do to every other department of your works. A labor-saving appliance is as much to your benefit in your foundry as it is in your machine shop. A dollar made in your foundry is as good as one made anywhere else about your works. Because the foundry is dirty and smoky do not neglect it; give the men every convenience to do their work with; costs cannot be reduced by compelling men to work at a disadvantage. Think of this sometimes when you send into your foundry badly made and worn-out patterns, old broken castings and a few strips and sweeps.

I wish to bring up another point. Are we not asking our molders to do work that a laborer could do? In the majority of shops the men commence work at 7 o'clock. How many do you find molding much before 8 o'clock? They have been one hour doing work that the laborer should do, while they should have been molding. The average pay for the best molders is 30 cents per hour, while the wages of the laborer

*From a paper by R. C. Cunningham, read at the Buffalo meeting of the American Foundrymen's Association.

is 12½ cents. Every hour you have a molder cutting sand you lose 17½ cents. If you have fifty molders, you start off every morning by losing $8.75. How many have ever thought of this? Many are under the impression that you cannot get any more work done by having everything ready for the men when they come into the shop. If you have a molder who will not do any more work by having his sand cut up than if he had done it himself, he is not a profitable man to have in your shop, and if your foreman is unable to get any more work done by having the men commence work at 7 o'clock than he could if the men had cut up their sand and had commenced work at 8 o'clock, he is not the man you should have to superintend your foundry. If you furnish your foreman with patterns properly made and necessary tools with which to do the work, you certainly have a right to expect your castings made at a reasonable cost. He must plan and lay out the work for the entire shop, so that there will be no time lost, and it is his duty to see that the men have the proper rigging with which to do their work, and also to insist upon work being done in the proper manner. He should never start a job until it is ready. It is the habit of some foremen to start a job and have the cerpenter bar up the flasks afterwards, while the molders are compelled to stand around and wait for him. From my experience I have learned that the majority of molders would be just as well pleased to wait for a new flask to be made after they got a job started, provided they do not lose their time.

To be successful, a foreman of a foundry must be a mechanic, capable of deciding any question that is brought before him regarding foundry matters, and if he should be called into the machine shop to be shown a defective casting, he should be able to tell the cause of the defect and know where to apply the remedy, whether it be in the molding, coremaking or cupola. A knowledge of chemistry is of great benefit to a foreman—in fact, only by knowing the chemical analysis of what goes into the cupola can he hope to obtain the desired results. When he knows the results obtained and the chemical combination which caused them, he knows that a reproduction of the same combination under the same conditions will reproduce the same effects, or, in other words, like causes will produce like results. With this knowledge he can choose irons that will produce a mixture of any desired analysis at the lowest possible cost. A foreman must be a good judge of human nature, so as to be able to manage his men in a manner that will induce respect for himself; he should never lose his temper or make use of profane language while talking to his men; he should not have any favorites, nor stop one man from doing what he allows another to do; if he makes a rule he must enforce it, and so show his men that he is managing the shop and not they.

There is no trade that requires the skill, patience and good judgment that molding does. It is often pursued under the most wearisome conditions. The result at best is an uncertainty. We should not be asked to "make bricks without straw," but supply us with good material of all kind, and then you can expect good results. The sooner the foundrymen realize this, the sooner they can look for a greater reduction in the cost of castings and an increase in the output from the foundry.

Producing Explosions by Wireless Telegraphy.

An inventor, Albert Breydel, describes in the "Moniteur Industriel" an improvement upon wireless telegraphy which he has devised. By means of it, he claims, he can telegraph over a distance much longer than the 30 odd miles to which the Branly tubes of filings are adapted, and, furthermore, the principle may be availed of in setting off explosives, producing magnetic action and even in telephoning.

His theory is, that while long, slow electric waves are conducted preferably through solids, short, rapid ones move most freely in rarer media, especially the ether, traveling by radiation.

In firing explosives at a distance he uses for a transmitter a powerful wave generator, which sends the waves in a straight line in a definite direction, like the lense of a lighthouse, and acts, so to speak, by a vibratory shock of high tension, rather than by repeated vibrations. The receiver, connected with the explosive charge, includes a detonator composed of a little accumulator or pile intended to fire a special priming; a Branly tube is placed in the circuit and only becomes a conductor after one or more discharges of the transmitter. The receiver is enclosed in a casing which can be adjusted to admit waves only from a certain direction or to cut them off entirely. Instead of the priming to cause an explosion, an electro-magnet or other device may be used to produce different magnetic, mechanical or electrical results. When the Branly tubes are replaced by special ones or rarefied gas, messages may be received over a longer distance.

If these claims are all well founded, the invention is one of the first magnitude.

Home-Made Lathes.

Passing through a large German shop which is run on the "slow and easy" plan I saw a big gap lathe which seemed unlike anything in "the heavens above or the earth beneath, or the waters under the earth"; and, inquiring whose build it was, was told that it was made there for private use—*i. e.*, not for sale. Asking whether it would not pay better to buy a lathe from someone who was rigged out with patterns and jigs for lathe-building, I was told that such work was done in the winter, or at other times when work was slack, to obviate the necessity of turning off hands, and that about half the lathes and simple machine tools in the place were so made. In the gallery I saw about a half dozen half-finished monitor lathes, and was told that these were also made to put in time with, and that some time or other, when work was slack, they would be finished and set up—not sold. They were reasonably close copies of the American monitor lathe of the vintage of 1875. As self-respecting American machinists usually say that they would not be found dead in a shop where there was a gap or "goose-neck" lathe, the model of the one here made was probably German or British. The bridge-piece or gap-piece was only long enough to enable the carriage to run up close to the face-plate, being bolted on at the right-hand end only, thus in no way serving to stiffen the bed.

In the average American shop the proprietor who had more hands than work and did not wish to lay off anyone would either have some patent or some "kink" which he had been waiting for time to develop or he would advertise for some specialty to build. I remember in the very dull times about 1893 or so that Brown & Sharpe were working away like beavers at some sort of milling machinery quite foreign to their usual line, being in fact for flour milling, and the result was to raise the standard of workmanship and reduce the price in that line all through the country, consumers having learned the value of high-grade work and manufacturers or builders seeing the necessity of competing with the Providence samples if they wished to hold the market with those made where, to paraphrase Sir Joshua Reynolds, they "mixed their emery with brains."

The German concern of which I am speaking make steam engines—mostly no two alike—and could have put in its time to much better advantage by getting up a special boring and facing mill to obviate five settings of a cylinder.

ROBERT GRIMSHAW.

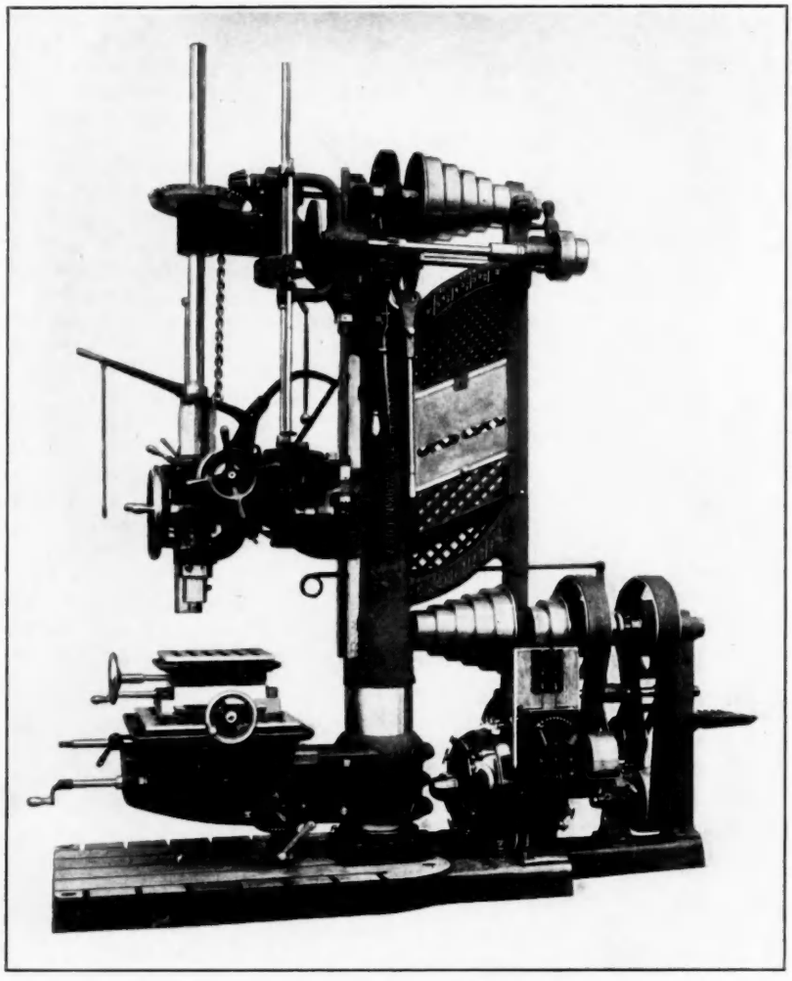
The Engineer's the Noblest of the Professions.

When I say the noblest of the professions I do not speak lightly; I speak with a due sense of the meaning of my words and with due respect for my audience. The church can give us more examples of devoted lives. Medicine does more for the immediate relief of human suffering, and perhaps does more of self-sacrificing charity than any other profession. The bar has furnished more of the constructive intelligence which has built the social and political system of the civilized world. All that is true. Yet when we mass the contributions of the engineer to modern society, when we consider the physical, the intellectual and the moral results of his work we must conclude that his is the noblest of the professions. For example, Mr. Abram S. Hewitt once said that Sir

Henry Bessemer had done more than any other man to break down the prerogatives of the privileged classes of Great Britain; that Bessemer was the great apostle of democracy. I cannot stop to develop Mr. Hewitt's idea further than to say that Bessemer did this work by reducing the cost of steel and hence the cost of transportation. Thus he opened to the poor man the markets of the world for his labor and his food. So it has come about that you can get a loaf of bread carried from the fields of Dakota to New York city for one-third of one cent, and so it has come about that the wages of one mechanic for one day will pay for the transportation of the food for one man for one year from Chicago to London. And let us consider for a moment the results of the engineer's contributions to sanitary science. The annual death rate in London in the last half of the seventeenth century was 80 per 1,000; now it is 20½ per 1,000. Again, in 1850 the median age of the white population of the United States was 18.6 years; in 1900 it had risen to 23, an increase of 24 per cent. in 50 years.

These are merely examples of the material contributions of the engineer to society; you cannot escape him. All civilization is dependent on his work. You cannot conceive of society without him.

But these are the material contributions. Beyond that are the intellectual and the moral contributions. I hold that there is to-day no other intellectual and no other moral training in the world so acute, so severe, so wholesome as the training of the engineer. This I know sounds extravagant, but again I speak with a full sense of my responsibility and after long deliberation.—Col. H. G. Prout, to the graduating class of the Rennselaer Polytechnic Institute.



A HEAVY DRILLING AND TAPPING MACHINE.

Heavy Drilling and Tapping Machine.

The accompanying half-tone illustrates the most recent design of electrically driven upright drilling and tapping machine made by Gould & Eberhardt, of Newark, N. J.

Separate spindles are used for drilling and tapping, the drilling spindle being nearest the observer in the position shown. After drilling the work is shifted to bring it in line with the tapping spindle by means of the compound traverse table. The capacity of the machine is for tapping up to 1½ inches.

The well known Gould & Eberhardt system of indicators for the cone pulley belt will be seen to be included in the machine. The set of figures on the lower brace gives the position of the belt for such sizes of drills as do not require the back gear and those on the upper brace are for use with the back gears. The back gears are operated by a single movement of a lever. The feed is driven by its own belt and is thus independent of the drill spindle speed. The rate of feed is varied by two friction disks, as shown and an index on the rod shows the settings to give the proper feed for different sizes of drills. The spindle is fitted with automatic stop and depth gage. Automatic and hand feeds are fitted to both the quill and the drilling head. This latter may be operated through the entire length of the planed surface on the column and both the planed surface on the column and both feeds operate in both directions.

The electric drive will be seen to be arranged in a novel manner. Both belts are open, but one of them is made to operate the reverse motion for withdrawing the tap by a pair of gears which connect the armature shaft with the driving pulley shaft and so reverse the motion of the latter. A pair of friction clutches operated by the horizontal rod enable either motion to be engaged as desired.

To compensate for wear the spindle is fitted with double conical bearings in the quill. The quill is square externally as the clamping surface is considered to be more effective and to give greater rigidity in boring deep rough holes.

In addition to the compound traverse table the machine shown in the picture has a portable compound chuck by which the machine is made available for use as a profiling machine.

As a matter of convenience the T-slots in the base are of such size as to take standard square head bolts. The machine is made in 25, 32, 37, 43, 48 and 53 inch sizes.

The "Technolexicon."

We have received printed matter and a letter from Dr. Hubert Jansen, who has been appointed editor-in-chief of the "Technolexicon," which is a technical dictionary to be published by and under the sanction of the "Verein Deutscher Ingenieure," and which it is expected will have correct technical terms pertaining to the various industries and branches of engineering in French, German and English. The society named and the editor wish to secure, so far as possible, the co-operation of engineers and professional men throughout the world in order that this dictionary may be the best and most reliable thing of the kind ever published. We believe that this object will be attained and that those of our readers who can render any service toward the perfecting of the book will be doing a good work.

Such as may be interested will be supplied with the necessary instructions, blanks, etc., by application to Dr. Hubert Jansen, 49 Dorotheenstr., Berlin (NW. 7), Germany. This dictionary will be the more useful to all who use it if it gives both the English and the American technical terms where these differ. For instance, "poppet head" in England is "footstock' here and "sliding spanner" in England is "monkey-wrench" here, and we suggest that those who may be in a position to give Dr. Jansen information about these varying English-language terms should do so. He will supply blank book upon application.

Friction Clutches.*

I have met a number of manufacturers who have been interested in friction clutches to their sorrow. They may tell you a friction clutch is a useless expenditure; they positively know it; have been there. Allow me to tell you how, in all probability, they got there. We will assume that the manufacturer is an alert, energetic business man, always on the lookout for anything that will reduce the cost of his production. He learns that his neighboring manufacturer has introduced a system of friction clutches in his mill which has proven very satisfactory, there being quite a saving of coal and wear and tear of machinery. He learns that each room in his neighbor's mill is controlled by a friction clutch, by means of which the machinery in any one of the rooms can be stopped without shutting down the entire mill. He sees his way clear to run certain departments overtime, to get out rush orders without running the entire plant. He sees, for instance, that he can save a few hours' running of his picker room; further, should an accident happen in any particular room, such as the breaking down of a machine or the parting of belting, or incidentally should some operator be so inconsiderate of his own welfare as to get mixed up with the machinery, the throwing out of the friction clutch that controls this room will prevent the shutting down of the mill and perhaps save a life. After following this line of thought for several days, he decides that the clutch idea is a good one and calls in his various foremen to talk the matter over. Of course, they usually think just as he does. The old man machinist, who is doing some light job around the office at the time, probably overhears what is proposed to be done. He dare not on his life speak up in front of the big fellows, but at the first opportunity sneaks out of the office to find his apprentice and tell him the wonderful things that are to happen. No one realizes more than this machinist, usually the repair hand, what a hard job it is to please all people at once, and the time when it tests his patience, and in fact the patience of the whole outfit, is when he is called upon to disconnect the jaw clutch that runs, say, mill No. 3, and put the bolts in the old Dutch coupling that is used to couple up the engine and water wheel, when the water goes low on the dam. Do his best, the mill will be shut down half an hour, and everybody thinks he ought to do it in less time.

Our manufacturer probably goes a step farther. He realizes the loss is nearly an hour by the time the operatives get back to their machines and everything is running in the same good shape as before. This last view of the situation is usually a clincher. The jaw clutch and Dutch coupling were installed because they were cheap—that is, the first cost—but he begins to see that they have been a dear investment. Getting confidential with the boss weaver, he remarks: "Tom, I really believe those two old couplings downstairs have cost us the price of that new engine and water wheel we want so badly. Why didn't we get at this clutch business before, and to think those fellows over the way should get ahead of us. One thing, though, they don't know how to buy over there. The agent put the whole outfit into an engineer's hands, giving him full swing to put in whatever he thought best. I was talking with one of the directors of their mill the other night, who said it cost them a pretty penny. Now, Tom, I want you to see their boss carder, find out how the trick is done, and I will buy the clutches. Our machinist will fit them up and we will show these fellows how to save money."

This is just where the manufacturer made a big mistake, and when "friction clutches" are mentioned within earshot of him, it is like raising a red banner before a bull. Had he done as his neighbor, called in the services of some honest fellow who was competent to advise him as to his particular wants, he would have been just as contented with life as his neighbor and would have thought a friction clutch was blessed instead of, well, otherwise, as he now does.

To construct a good efficient friction clutch of any class requires a great deal of patience of the cut and try order until the parts are so constructed and balanced that the clutch will back up the principle involved and when put on the market it will not be a source of annoyance on account of the weakness of some apparently unimportant part. I would advise that when you get your clutch, be sure it is fitted by a careful and exact machinist who is well acquainted with the clutch in hand. Provide solid, substantial foundations, and in the case of large friction cut-off clutches use a connecting bed plate for the bearings on each side of it, and when it is erected, be sure the shafts are in perfect alinement and that they will be held there.

The growth of the friction clutch industry has, like many other good things, been phenomenal. It is my firm belief that there has been manufactured and put upon the market a larger value and greater number of friction clutches in a single day in this year, 1900, than was produced in the whole year of 1875. The general introduction and use of electricity has been largely responsible for the increased demand for first-class friction clutches. The high speeds at which they are invariably run in electrical generating plants and the extremely severe duty required of them for this class of work has brought out the best efforts of our mechanics in producing satisfactory running clutches. It has been one of the best advertising mediums of the friction clutch business, and has, in many instances, shown to inquiring minds the advantage of the adoption of friction clutches in other channels of work.

It is an accepted fact that no first-class builder of machine tools, or of any other machines that need to be stopped and started frequently, does not find it to his advantage, as well as to his customer's, to use friction clutches to operate the said tools or machinery. Compare the ordinary engine lathe, built on modern lines, having a good friction clutch pulley countershaft, with that old annoying arrangement having a jaw-clutch pulley countershaft. The slam-bang noise of one of these pests when in use in a shop is enough to put the men's nerves on edge, to say nothing of the hard labor and skill necessary to operate it and the liability of spoiling the work in hand. The trials of operating one of these old jaw-clutch devices is enough to make one want to send the fellow who had nerve enough to make it to the place where St. Peter sent the man who gave him lessons on the bicycle.

Go a step further and compare the modern friction clutch pulley countershaft with the old tight and loose pulley affair with its shifting, sluggish, squealing belt, which is continually wearing out and breaking down. Note the ease with which the operator controls the machine having the friction clutch device. He can do more work, better work, with less exertion and less wear and tear on the machine and belts. Yet it is not such a long time since the manufacturer, and even the operator, thought the old jaw-clutch or tight and loose pulley device on a lathe was pretty good. The fact is, they did not know of anything better. It is human nature to judge by comparisons, and the enlightenment in the use of friction clutch devices, their advantages on a lathe counter or any other machine, is the reason of the ever-increasing demand for the many thousands of friction clutches manufactured annually and the enormous increase in the number of willing buyers.

*From a paper read before the New England Manufacturers' Association by Richard H. Hill.

One of the most practicable and efficient ways of stopping the noise of a gas-engine exhaust is to run a small jet of water into the exhaust pipe. A very little water seems to answer the purpose, though more than it would be practicable to provide for an automobile, alas!

The Atmosphere the Universal Conveyor.

A correspondent writes to us as follows: "Please let me and other readers of the 'American Machinist' know why it is that finely divided solids will float in a medium, liquid or gaseous, of less specific gravity than the solid. As examples, finely divided brass, iron or steel, resulting from the polishing of such metals, will float in air, even when the air seems to be almost motionless; steel worn or rubbed to a powder by a dull drill or other tool running in oil will float on the oil, though it has been from the first and still is wet by the oil."

The child-like faith in our ability to answer such questions as this, as evidenced in the continual propounding of them, is certainly flattering to us, but is none the less embarrassing. We certainly cannot answer this question to our own satisfaction, and it would be rash to suppose that our answer would satisfy anyone else, so we will not attempt to propound one, but we will call attention to one or two facts bearing upon this question tending to illuminate it and tending also to stimulate some thought upon the subject. Whenever a number of minds can be provoked to serious thought upon any topic something almost invariably comes of it.

The first thing to notice as bearing directly upon the above question is the relation of the surfaces to the weights of bodies of different sizes. Of course the laws governing the matter were long ago investigated by the physicists, and no one in calling attention to them at this late day can claim to be showing anything new. The ratio of the exposed surface to the solid contents of bodies becomes rapidly and immensely greater as the bodies decrease in size. The weight varies as the cube of a side, or any corresponding dimension, while the surface varies as the square of the same. In going upward the solidity has the advantage, and in going downward the surface leaves the solidity out of sight. A cube will illustrate the principle, although it is to be borne in mind that the minute particles of matter resulting from industrial operations are probably never even approximate cubes. Say, then, that we have a cube with a side of 6 inches. The solid contents of the cube will be 216 cubic inches and the surface will be 216 square inches, or there will be 1 square inch of surface for each cubic inch of the solid. Now, if we go downward, we come to rather astonishing results before we go far. The following will convey the idea:

Side of Cube Inches.	Solid Contents of Cube.	Surface of Cube.	Sq. Inches to 1 Cubic Inch.
6	216	216	1
1	1	6	6
$\frac{1}{6}$	$\frac{1}{216}$	$\frac{1}{6}$	36
.1	.001	.06	60
.01	.000,001	.000,6	600
.001	.000,000,001	.000,006	6,000
.0001	.000,000,000,001	.000,000,06	60,000

If the side of the cube were one hundred thousandth of an inch, and it is down among such dimensions, and far beyond, that we must go when we talk about dust particles, the surface of one cubic inch of such particles would be 600,000 square inches, or 50,000 square feet, or considerably over an acre. The largest balloons probably have about one quarter of this surface, less than that rather than more. Now, when we think of one cubic inch of heavy metal, say, iron or steel, with as much surface exposed to the air as that of four large balloons, it would seem that little more need be said as to why dust floats in the air. The friction becomes so great for the weight that the dust particle can scarcely move at all through the air, and it would not be difficult to believe that it could not of its own weight move at all. We find, however, that the weight does count and have effect in the long run, as is shown where rooms are long tightly closed and the dust settles upon everything. Draftsmen in rooms connected with shops or foundries known well enough how the air carries dust, and how in their usually quiet rooms the dust is continually descending through the air.

The increase of exposed surface with the subdivision of solid matter, and the consequences involved have been recognized and investigated especially by geologists in connection with the erosion of rocks and the conveyance and deposition of material by flowing water, and it is shown that this minute pulverization of matter and the ease of its conveyance have had much to do with the shaping and changing of the earth's surface. All flowing streams are continually carrying materials downward and depositing them in other places. The rivers all have their deltas. The banks in time become fertile islands. Lakes by the thousand are filling up and becoming swamps and marshes, and then fertile plains.

All this seems simple and plain enough, but it brings us up at once against another question that is perhaps even more difficult. Returning again to the air we are led to ask if the minute particles have such difficulty in moving through the air, on account of the great surface exposed and the conseqent friction, how is it possible for dust to diffuse itself so rapidly through the air? This is probably explicable by the fact that it occurs when the dust or the air, or usually both, are in motion. In sweeping or brushing, the air is of course always stirred as well as the dust, and more than the dust as its volume is greater. In all cutting or abrading operations the motion of the air is also always unavoidable. If the dust is quiescent upon a surface, and if the air is still, it will not rise of itself and diffuse itself through the air, but if both are in motion the case is different.

The sustaining of the dust particles in the air by friction of surface obviously does not apply to the conveyance of moisture in the air. In the diffusion and intimate intermingling of gases and vapors friction seems to be annihilated. More than that, there seems to be an active force driving each forward into the other until they are completely mingled. If we can imagine two equal vessels placed one above the other, with an impenetrable partition between them, the upper vessel being filled with hydrogen gas and in the lower vessel being a perfect vacuum, we know that if we cause the partition to disappear the hydrogen gas will at once expand and fill the vacuum, and the contents of each vessel will be alike and equal. So if we have a vacuum in the upper vessel and have the lower one filled with carbonic acid gas, and then remove the partition, the gas will at once fill the upper vessel. If we have the upper vessel filled with hydrogen gas and the lower vessel filled with carbonic acid gas, both under equal pressure, and then remove the partition, it will not be long before those gases will be perfectly mixed, although the lower one is twenty-two times as heavy as the upper one. Each gas seems to be impelled into the other as though neither gas fully occupied its own space, and there was, so far as the other gas was concerned, still a vacuum remaining between the particles of each into which the other could rush.

The operation seems to be quite similar where the vapor of water and unsaturated air have access to each other. We have quite a striking object lesson bearing upon this point before us as we write. As is well known, the Croton water supply of the city of New York has cost the city vast sums of money, and the supply of the Greater New York must cost vastly more, and the cost must continually grow with the city's development. It is estimated that of the water which it costs so much to collect, to store, to convey and to distribute, more than one million gallons per hour are lost, wasted, thrown away, in the form of exhaust steam. From our eyrie we can look out over the roofs of the busiest portion of the city and see this operation going on. From most of the roofs which we overlook we see the exhaust steam escaping, steam that has been employed for elevators, for electric lights, for pumps and for power development in the multifarious industrial operations.

The wonderful thing about it, and none the less marvelous that it is familiar, is the rapidity with which the air absorbs and conveys away all this moisture. As we look out over the roofs we see each stream of steam disappear so quickly that scarcely one can touch or mingle in the least with its neighbor. As a rule, we may say that the exhaust from each building is absorbed by the air within the area of the building's own roof and within a hight of three stories above it, and all this while the meteorological observatory is already reporting an atmospheric humidity of over 50 per cent. Immediately beyond where the steam disappears, and wherever the

steam is not visible the air is as perfectly transparent as ever. As far as the eye can tell it is only pure air; yet who can say how much it is carrying not only of water but of every kind of solid matter? We can easily believe, with this sight before us, that the visible clouds are not the principal conveyors of water over the earth, that they show really only the transition states of water in the air, that the water is mostly carried by the transparent and invisible air, that clouds when we see them are always either forming or dissipating, as the temperature or pressure of the air is varying.

As to the floating of dust particles upon water, about which our correspondent speaks, the considerations which show their buoyancy in the air would seem to amply explain that, as the liquid is so much the heavier; but in connection with liquids another point is to be noted. The minute particles resulting from the cutting or crushing of solids we may assume to have shapes similar to those the larger and easily visible fragments take, and we know well enough that these are never of any predetermined form, but of every conceivable irregularity of outline. They are also usually rough and jagged, and plane surfaces are rare. Then we know that liquids have a habit of forming films from one protuberant point or angle to another wherever they find a chance, instead of penetrating and filling every interstice. The particles we may conceive to be enveloped in the stuff of which bubbles are made, instead of being wet all over with absolute intimacy of contact. This serves to explain many instances of the flotation of minute particles upon the surfaces of liquids. Time counts even here, and the floating particles will in time mostly settle into the liquid, and after they have once passed below the surface no stirring will ever give them the trick of floating at the top again.

The function of air and of water in the conveyance of matter over the earth seems to be vast and universal, and one of the most interesting fields for investigation. If nature abhors a vacuum, so she seems to be also opposed to rest and stability.

Benefit to the Employee Through Associations of Employers.

The employer and employee have been brought more closely together through the influence of this organization than was ever dreamed of ten short years ago. A spirit of moderation, of toleration, of equity, is superceding the old desire to fight, and pervading their business relations. The employer is learning, through these conferences with his fellows, that he doesn't always pay the best wages, furnish the best equipment, treat his men more kindly than all other concerns. He learns that other men have poor molders, poor contracts, and their losses in business; and he has also sometimes learned that his employees are men and can appreciate fair business-like treatment, and will often respond more quickly than he expected.

He is beginning to realize more fully that in order to get the best services, the best results, he must protect his men and give them every assistance in his power. On the other hand, the employees, as a direct result of their employer's actions, are learning that their employers are not the hard-hearted Shylocks they have been so often represented. Consideration of his interests and the value and rights of capital are finding fairer treatment at their hands. They are learning that a firm cannot pay out $3 and get back only $2; that the employer has responsibilities and expenses and hard times, the same as they; that the conditions of trade must regulate their demands; and they are not as ready to run into strikes and conflict, incurring bad feeling and loss on both sides, as they were before this organization was perfected and the results of these conferences began to be felt.

This association has been, and is now, a true friend to the mechanic. We know it has bettered his condition and added dignity to his calling; it has brought him in closer touch with his employer; it has shown to both how identical their interests are, and they are marching onward with a greater degree of unity of purpose, with more charity in their hearts, and with more of a "give and take" disposition in their business affairs.

Well can I, though still a young man, remember the day when the founder concealed his improvements from the public like a miser would hoard his gold. If he discovered a cheaper or a better way to do his work he sealed his mouth and built a high board fence around his plant, jealous of the little he had accomplished, not able to take the broad ground that an interchange of ideas and experience would redound to the credit and benefit of all. He believed he had found something no one else would think of, a monopoly on the brains in the business, and he hugged himself in his own shell. Yet, had he looked around he might have found a dozen improvements, devised by others and applicable to his own business, of far greater value. But this is all changed, for here to-day come the representative men in this great industry, proprietors, superintendents and foremen, all ready and anxious to contribute their mite to the general fund of knowledge, and receive in exchange the assistance and advice and experience of others, an exchange that is a benefit to all, and is raising the standard of the business from a mongrel nondescript, "go as you please" sort of a trade, to a foremost position among the most scientific and artistic professions of the mechanical world. This association has made better molders, better mechanics and better work. When the heads of concerns begin to exert themselves intelligently in these matters, the effect is felt all along the line. When employers begin to bring their foremen with them to these meetings, and sometimes they have to come to such a place to get acquainted with the man they have worked with for years, they begin to make better foremen, and better foremen make better mechanics. —Senator Romp, at the Buffalo meeting of the American Foundrymen's Association.

The Professional Spirit.

But what is the professional spirit? The business man measures his success by the money profit that he makes. He may or he may not have produced a beautiful article or a useful article; he may or he may not have added to the health or the happiness of the group of people just around him. These considerations are secondary; the primary considerations are dividends. Mind I am not expressing an opinion or criticising motives; I am stating a fact. On the other hand, the primary consideration with the professional man must be the interest of his client, whether that client be a man or a city or a state. He can think only incidentally of his fees. In fact, much fine professional work—much of the work most useful to the world is done without any fees or money return whatever. Do you suppose that a sense of money to come or personal reward was present in the mind of Grant in the Wilderness campaign; or of Roberts when he marched to Kandahar; or of Sampson when he organized and maintained that magnificent and unprecedented blockade of Santiago? Do you suppose that Newton or Lord Kelvin worked for money or even for fame? Think of the multitude of commonplace men who are working all the while under the impulse of a great motive without knowing it. That, I think, is quite wonderful. Fortunately for the progress of the human race man is endowed with a sense of duty, with a thirst for knowledge, with a desire for the approbation of noble minds. So the true professional spirit is evolved, and this spirit must save the railroads and the great industrial corporations from some of the disasters which arrogance and ignorance are provoking.—Col. H. G. Prout to the graduating class of the Rensselaer Polytechnic Institute.

Industrial Education at the Ohio State University.

The annual catalog of the Ohio State University is an evidence of tangible effort in the direction of industrial education. It has a department in ceramics and clay working which includes brick, pottery and cement working, and a course in industrial arts which is intended for those who aim at positions relating to the business side of manufacturing industries. The former of these is distinctly in the line of the monotechnic schools of Germany. Both are of four years' duration, though

shorter courses are offered in both subjects. Full courses in mechanical, electrical, mining and civil engineering are also offered.

Tuition is free. Annual expenses are stated to average only $219, and considerable opportunity for self-support exists.

Letters from Practical Men

Straight Line Graduating.

Editor American Machinist:

The cost of marking regularly spaced lines, as in making scales, depends almost entirely on the degree of accuracy necessary to be obtained. The process used in graduating a fine vernier evidently is quite inappropriate in making a carpenter's rule, and the carpenter's rule in turn is probably more accurate than a "scholar's companion" scale. Straight line graduating may be produced by a number of means, as engraving, etching, pressing, stamping or rolling, each of which has its own peculiar advantages, depending upon the nature of the work and the quality of the material. Processes well adapted for operating on soft stock will not always readily apply to that which is harder; common examples of the difference being known to every machinist who has an ordinary and a "spring tempered" scale.

The conditions to be met in cheap scales, used as indicators rather than as measuring instruments, are somewhat different, inasmuch as a high degree of accuracy is seldom necessary; a variation, from line to line, of plus or minus, may be tolerable, but the ultimate or aggregate error not be great.

Another condition is that a scale to be used as an index should agree with the rack, screw or other feed action of the apparatus to which it is applied, rather than be correct in itself, as a uniformly divided scale. Examples may be noted on the barrel of a micrometer, where the cross lines act as indexes only; the long line, in the same plane as the screw, giving it its real accuracy. Another example may be found in the numerous scales used upon typewriters, which are an index of the feeding devices only.

The common method of engraving, or more properly cutting, is that in which a finely pointed tool, of extreme hardness, is carried by a most carefully constructed machine. These machines are of many different styles, most of them resembling, in a general way, a traveling head shaper; some use cams, others levers, on the pantograph principle, and still others depend for their accuracy on a "precision screw." Necessarily their production is expensive, and their field of usefulness is limited to such material as will not too readily dull the cutting tool.

Etching is resorted to on hard material; the work being first coated with a protective varnish, impervious to the effects of the acids or other chemicals used in the etching bath, which performs the actual cutting or removal of stock. After the varnish has dried, it is scribed by a stylus, or fine-pointed tool, in predetermined lines, down to the surface of the material. The machinery may be the same as that used in the engraving process or specially devised for the purpose, and is usually so arranged that a number of pieces may be operated upon at once. A peculiarity noticeable on etched work is that few, if any, of the pieces have the lines brought fully to the edge; this is on account of the danger of breaking away the protective coating from the corners, exposing undesired surface to the effects of the "bite" of the acids in the bath. Another disadvantage is that should any minute holes in the coating exist, or by chance any portion of the metal be unprotected, a spoiled job results; and further, if the pieces are allowed to remain in the etching bath too long, the lines will be undercut, rendering them jagged, rough and unsatisfactory, as were most of the earlier attempts at this process.

Scales 9 inches long have been satisfactorily graduated in a power press, but the expense in making the dies and the careful adjustments necessary to get uniform impression along the line render it an objectionable process and limited in its application to short work.

All mechanics will readily recognize the difficulty likely to arise in hardening a piece of steel 9 inches long. Some change from the original shape and length is bound to occur; hence it is found desirable to make the dies in sections, ordinarily of an inch in length, correcting the error found therein by grinding to standard dimensions and clamping the units together in order to have anything like accurate measurements.

The distortion of the scale itself, under the blow of the press, is considerable, always necessitating straightening of the piece, and thus incidentally introducing an error, by an increase in the length, the amount of which is a variable quantity.

Roll graduating is nearly, if not quite, as speedy a process and does not require such a degree of accuracy in the roll as it does in a die. Just why this is so may not be evident, but experiment proves it to be the case. By the formation of but one line at a time, although continuously and speedily, the depth of impression and the ductility of the stock all affect the results far more than in die graduating. Moreover, in roll graduating, the roll is usually, and should be in all cases, geared to the moving work table, so that the periphery of the roll, or that part of it which may be considered as the pitch line, is advanced at the exact speed and uniformly with the work surface. If this be not the case we have a condition which may be likened to the attempt at hobbing a worm gear, depending upon the hob to rotate the blank. As this will usually result in producing a thin tooth, so will the ungeared engraved roll tend to produce a lesser distance between each line than if it is made to travel positively and proportionately with the work.

In any case, however, where the scale is made by the impressions being forced downward into the stock, displacing the molecules of the metal, in a manner similar to the effect known as "peening," the metal will be stretched accordingly. This effect will be far more noticeable on scales of narrow section, having numerous short lines near the edge, to which a decided curve will be imparted, no matter how firmly they may be clamped while undergoing the process.

The rolling of graduations on scales of round section, either rods or tubes, is an easy matter and quite satisfactory; while the best results, either by pressing or rolling, on flat scales are obtained when it is possible to so design the scale as to have it comparatively wide and the graduations placed near the center, rather than close to the edge. The reverse of this is also true, as, when it is possible to form the scale with both edges graduated, the curved effects on the sides are mutually counteracted. W. E. Willis.

Some Points About Drilling and Drill Speeds—Oiling Shop Floors.

Editor American Machinist:

If you will refer to the Morse catalog you will find that for drills ¼ to 2 inches diameter twenty-eight different speeds are called for, and to get the best results this number of different speeds should be run. I think it is true that for each diameter there is but one right speed and feed for the drill; any other speed or feed either injures the drill, lessens the quantity or lowers the quality of the work. Now, if you will examine the various drilling machines made in this country you will probably find that the greatest number of speeds provided for on any one machine will be about eight, and a less number of feeds.

I have lately read in a catalog of a driller manufacturer something as follows: "In designing these drilling machines the aim has been to supply the very best type of this class of machinery and furnish a tool which, by actual service, will demonstrate its intrinsic value. We have embodied in these machines every modern and practical improvement, and know that we are furnishing a tool strictly up to date in design," etc.

The above is about what all of the drilling machine makers will tell you. Now, I think it should be, and no doubt is, the aim of every tool builder to make the best; and now that we are in the twentieth century, surely the time is come to design drill presses with speeds suitable for the diameter of the drills and the character of the work. For illustration, see the large number of shops that run several cutting-off machines. These

machines usually have four speeds. A 2-inch round piece of steel is to be cut off, and the most suitable speed is set for the 2-inch diameter. Now, we all know that at each rotation of this piece the speed of the cut is reduced. Say you start with thirty turns and continue down to ¼-inch diameter running thirty turns, while as a matter of fact at ¼ inch the speed should be about 300 turns.

I am thankful that some makers of cutting-off machines have provided for an increase of speed as the tool approaches the center. Will the makers of other machines stop and think how necessary it is to have a greater number of speeds and feeds? You will notice in your issue No. 10 that the Morse Twist Drill & Machine Company is advertising its drill to be used with compressed air to force out the chips. This air also keeps the drill very cool. I have known of a 19-32 inch drill running about 460 turns in cast iron, drilling 490 holes, 5 inches deep, feed .01 inch, and sharpened twice; this drill was a Morse oil drill, having compressed air forced through it. Do you think that we can find many of the drilling machines suitable for 19-32 inch drill that will give you 400 to 500 turns?

Another suggestion for the maker of drilling machines will be to provide some way to take care of oil and chips and oil pump. Also when compressed air is used to catch the chips and dust that will be forced up through the grooves, and if not taken care of will ruin the running bearings of machinery.

A friend of mine lately asked "How do you keep your floors so clean?"

I said: "What do you get on your floors to dirty them?"

"Oil."

"What do you pay for oil?"

"Fifty cents per gallon."

"That is what we pay, and I can't afford to dirty our floors with fifty-cent oil."

My friend looked at me rather funny and said "I never thought of it that way," and I then showed him how to keep oil from the floor. Some shops keep about 1½ inches of sawdust all over the floor to catch fifty-cent oil. I think a better way is to not allow the oil to reach the floor.

Many years ago Bement & Dougherty of Philadelphia made a milling machine which had cast around its base a gutter to catch and hold oil. I notice and am pleased to see that the experts and specialists in the lines of milling machines are now adopting the same style of base and oil gutter.

I lately asked a lathe maker: "Why don't you ship all of your lathes with a tank under them?" He replied: "Customers will not pay me for a few pounds of cast iron." Now a word to the customer and I will stop: Please remember that it will pay you to order your lathes with tanks and oil pumps, also your drill presses; tell the builders you want them and also must have something different for speeds and feeds. Don't talk about a few dollars extra that you will have to pay in starting. It will pay you a hundred times over. A. DRILLER.

Different Ways of Giving Orders.

Editor American Machinist:

In my experience in various establishments and under all sorts and conditions of superiors I have found the most marked difference in the methods of giving orders. A few of these points of difference the establishments were responsible for, but as a rule the manner of giving orders is left entirely with the individual who is giving them. I have heard somewhere that "A problem well stated is half solved." All we do in shops and drawing rooms is to solve problems and how much easier that problem would be if those charged with their statement would do it more clearly. In my experience I have met with but one establishment that had rules governing such matters and enforced them. In this place no one could start a piece of work of any kind without a written order from his superior stating fully and clearly what was wanted. The superintendent of that place could not come into my shop and *tell* me he wanted certain work done. He would write what he wanted. I was expected to preserve all such orders and likewise could not *tell* one of my men to start on certain work. I had first to fill out a time slip, stating on it what work he was to do. These slips measured 4x6 inches, so that a rough sketch could also go on it. The first work in the morning was to distribute the time slips to the men, and they would be upheld in refusing to start work until they received them. This may seem to some as an expensive and needless piece of red tape—it did so to me at first, but since leaving there I have wished it had been installed in every place where I have since worked. How many disputes it would prevent, and what an amount of friction it would eliminate from the conduct of the business of most works!

In contrast with such a system, take a few personal experiences in other places. A foreman once brought me a connecting rod and ordered me to weld it out immediately three inches longer. It came back, as it was wanted but two inches longer. This the foreman declared he had ordered me to make it, but I was equally positive he did not. There being no written order to settle the dispute it was settled as so many such are by my looking for another job.

In another place I was connected with the superintendent would send his office boy down with verbal orders for me to get out so many pieces of number, say, 1377. Anyone who has handled work in a factory where all the pieces are identified by numbers only will appreciate how one feels when taking such an order. It might have been 1477 or 1367 by the time the boy had delivered it, and such cases did occur. Yet the superintendent thought me a crank when I asked for a written order.

My drawing-room experiences have been the worst of all in this respect. I never feel that a drawing is finished until I see the machine built. They are always remembering something else that is needed on it. Of course a certain amount of this is almost impossible to eliminate, but I think the greater part is. I was once given a bundle of about twenty large drawings that contained all the details of a large machine and told to see if it was possible to hit a certain auxiliary on it. I was given only the work required of the auxiliary as my guide in the design. At the end of a week I had the design ready for the chief draftsman's inspection, and he condemned it at a glance. "Your wheels stand too high," he said. I replied that they did not interfere with anything. "Oh, yes, they do," he said; "there are two beams in the ceiling, right above where the machine goes, leaving but 18 inches between them and the top of the housing. Your machinery must come below those beams." This was news to me and meant another week's work getting out a new design; only to have it rejected because it had one more gear in the train than he wanted. No limit had been set before as to the number of gears. A third design suited, but when I started to detail it, I was told to limit my wheels entirely to the patterns in stock. As this was a heterogeneous collection, such as you find in a general machine works, it gave me more trouble to get the desired results with the stock gears than anything else I encountered on the problem. The case ended by my making a fourth design, from which the machine was built. Now, it looks to me as though the whole problem could have been clearly stated at the start, instead of in installments, and one design made that would fulfill the conditions.

My recommendation for giving orders for either shop or drawing room is: First—Let them be written. It is very easy to put down a memorandum on your scratch pad and thus avoid trusting to memory for sizes, etc. Second—Clearly define what you have already settled in your own mind as to what is to be done and the methods to be used in doing it; such matters as are not so stated to be worked out by the person taking the order.

Such a method, while requiring a little forethought, would expedite matters greatly in all shops and drawing rooms where it is not now in force. PERSEVERANCE.

Smokeless Combustion.

Editor American Machinist:

Mr. Booth, writing of the Bellville boilers, refers to the unsuccessful attempts to get smokeless combustion in the furnaces of water tube boilers, and this reminds me again of the persistence of ignorance and conservatism in such matters. Fully a

half century ago C. Wye Williams wrote a book on the combustion of coal, in which he set forth fully and clearly the principles embodied in smokeless combustion. It was in reality a scientific exposition of the subject, and so comprehensive was it that although others have written books on the same subject, no one has added much to our knowledge of the matter, and all experience and investigation since that time have confirmed the principles there stated. Hence there is really no excuse for any modern engineer making a mistake in constructing a furnace for smokeless combustion.

Yet in the face of all available knowledge on this subject, there are thousands of dollars spent yearly on the construction and trial of furnaces built with the belief that they will be smokeless, but which lack some of the features known to be essential to smokeless furnaces.

Of course it is not to be expected that there is any way of preventing useless waste of money in such experiments, but there is absolutely no excuse for modern engineers installing large steam boiler plants with such errors in the furnaces. Burning the smoke does not pay, and many of the abortive attempts at smoke burning are schemes for burning the smoke after it leaves the main part of the furnace, because they are obliged to make it invisible when it leaves the chimney. This is working at the wrong end of the problem, and success can be had only by preventing the gases from the furnace ever getting cool enough to form smoke. This is a case where an ounce of prevention is worth a pound of cure, and the correct thing is to burn the gases before they become visible as smoke. Of course there is nothing new about this, but it is necessary frequently to call attention to old truths, "lest we forget." Particularly all young steam engineers who are fitting themselves for the profession, should be well informed on the principles of combustion, and all such I would recommend beginning with Williams' book. BELL CRANK.

An Inspection Bureau.

Editor American Machinist:

The term "inspection" as usually employed implies a more or less minute examination of machine parts in process of production or assembling or of finished work, and while such examination serves a useful purpose and could not well be dispensed with it leaves much to be desired. Inspection, to be thorough, should be not only detective but preventive as well, and should include men, methods and materials; should not only point out defects but suggest remedies.

In the larger establishments a regular bureau could be maintained for this purpose alone and would prove a valuable aid in the conduct of many factories. A bureau could take care of raw and finished stock accounts in addition to its inspection, progress sheets showing progress of orders through the various processes and made up from inspection reports; time costs of various styles of product, communications between different portions of the plant, either 'phone, messenger or transportation, to issue all drawings and order all changes in same, look after all repairs to buildings, power, etc., and to keep all standards of measurements used for reference. It should be the business of the bureau to keep itself thoroughly informed in regard to every detail of the business both in the selling and producing departments and should be able to answer readily any question that could possibly be referred to it from any source; should in fact be a well-ordered intelligence bureau with enough authority added to make of it an inspection bureau. Having a knowledge of orders on hand and the relative importance of each to others it would see that the material was at hand, that precedence was given to work that was most needed, that it was started, and when started kept going. Being provided with the history of the business it could provide for stock in anticipation of orders. By the use of progress sheets the state of advance or rate of progress of any machine or lot could be quickly determined and inquiry from the sales department would bring out replies that could be relied upon.

The comparative time cost (in hours) would be valuable when improvements in tools or methods were in contemplation or for statistical purposes, and would be instantly available and reliable, which cannot always be said of those kept in the office.

By having control of all intercommunication it would itself be responsible for its most important equipment and repairs to buildings, etc., would naturally be reported to it in the same manner as other defects. All gages, measuring and testing machines come naturally in its care and every gage and instrument in the plant should be tested regularly by it. As much of the work must naturally be done from drawings the bureau should have a general supervision over their use and changes in them.

The force comprising the bureau must naturally be composed of persons naturally adapted for and highly trained in their respective duties; the inspectors should be mechanics with judgment and discrimination enough to know when a job is good enough for the purpose for which it was intended and to be able to ascertain the source of defects and suggest a remedy; the other work will be largely clerical. The bureau should be centrally located, so as to be easily reached from all parts of the plant and should be well lighted and arranged with especial reference to the various kinds of work to be done in it; in appearance half shop and office, but it should most emphatically not be an office department. A. B. CHRISTMAN.

[The above might be said to be the apotheosis of the inspection department, and if the ideas expressed were to be carried out it would seem that it might be a little difficult for the proprietor or the superintendent or any of the foremen to find anything to do. These individuals might contemplate the scheme with some equanimity during this torrid weather when to have nothing to do seems the most desirable thing on earth, but as an all-around working plan we fear it puts too much on the inspection bureau.—Ed.]

Cutting Bevel Gear Teeth on the Band Saw.

Editor American Machinist:

I have been reading with interest for some time the cutting of gear teeth on the band saw, and have turned down all plans shown, with one exception. I have cut bevel gear teeth on the band saw in the manner shown by Mr. S. H. Ortway in your issue No. 27, and have made a beautiful job in half the time it took to make it the usual way. I will add, however, to what Mr. Ortway has said already, that the ball and socket can be used again, with care, for any number of gears at any angle. J. B. SHIRER.

A Magnetic Tool Holder.

Editor American Machinist:

The photograph shows a magnetic instrument and tool-holder. Its main purpose is to hold the instruments for the draftsman in ever-readiness. When a draftsman is through making a circle, instead of being constantly annoyed by the instruments lying on top of the drawing, he merely slaps the instrument against the magnet and there it sticks. It may be very handily taken off again for making the next circle. This enables the draftsman to keep his drawing unobstructed, it also does away with the everyday occurrence of wiping the instruments off the table with the elbow or the sliding T-square, or, if he

A MAGNETIC TOOL HOLDER.

uses a tray to lay his instruments on, accidentally push the whole tray upside down, disturbing the entire drawing-room.

The magnet consists of two circular plates, about 4½ inches diameter, ¼ inch thick, connected by a center core about 1½ inches diameter. The space between the two plates, about ¾ inch wide, is filled with No. 27 double cotton covered wire, the two ends leading to the two binding posts on top of the holder. The plates and core are of tool steel and hardened. The holder is then connected in series with an arc lamp of 220 volts for a few minutes. It then becomes a permanent magnet and is ready for use.

I have been using one for four months, and find it a great convenience. Some of your draftsmen readers might be pleased to make use of this idea.

For dentists I should judge it will be equally as convenient. It also may be used in show-cases to attach any article made of iron or steel. JULIUS G. KREIS.

Hamilton, O.

Index Plate for Sectors.

Editor American Machinist:

The milling fixture as shown was made for milling teeth of the same pitch in sectors of different radii, ranging from 26 to 40 teeth to the complete circle, with 8 teeth in each sector. There being 15 sectors of different radii, it was required to have as many sets of divisions, which were contained in 5 index plates of 3 sets in each.

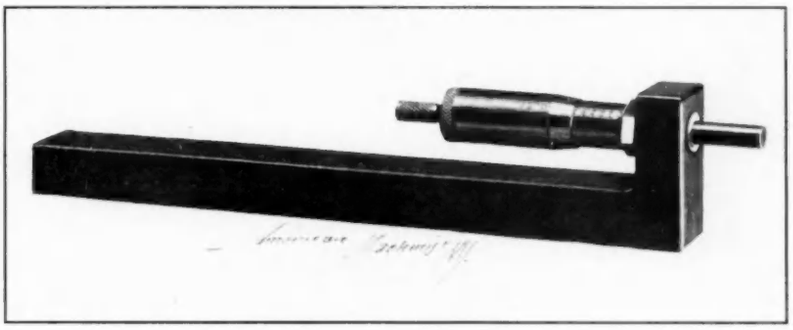
The most essential thing in milling these sectors was to have the first tooth in each sector at an angle of 30 degrees with the line *a b* of Fig. 2. Another essential thing was to have the indexing plates so made as to quickly interchange. Fig. 1 shows the indexing plate at *a*. By loosening thumb-nut *b* and removing plug, *c* is free to move to any of the three sets of divisions. Plug *c* is shown inserted through indexing plate into a bushing located in plate *d* with the required relation of 30 degrees to the arbor on which the sectors are placed for milling.

It may be of interest to note the method employed in cutting the indexing plates and in locating with exactness three holes by which the first tooth of each sector was known to have exactly the same relative position. A dividing-head of 360 divisions was used, on which, by the use of sub-dividing plates, all of the series of divisions were cut.

Assuming the first space of each set of divisions 120 degrees apart, or one-third of a circle, there remains a blank space of 23 2-26 degrees to complete 120 degrees in case of the 26 divisions, 24 18-27 degrees in that of 27 divisions, and 30 degrees in the 28 divisions, keeping in mind that for each set of divisions the indexing head was manipulated seven times to produce the eight teeth in each set. If the change of subdividing plates could have been made without altering the spacer of dividing head the indexing plates could have been cut, as in the case we have assumed, by moving dividing head on completion of last space in each series of divisions the required degrees and fraction of a degree to complete 120 degrees, but for the reason that each subdividing plate necessarily contains different numbers of holes, it could not be done in this way; therefore the method shown in detail was resorted to, with very satisfactory results.

Fig. 4 shows a transfer jig which is used for drilling and reaming holes *d*, *e* and *f* in uniform relation to positions *a*, *b* and *c* of indexing plate shown in Fig. 3, by applying the same to transfer jig and inserting plug *g* in the first space of each set of divisions and transferring through bushing *h*, as mentioned, with drill and reamer.

The milling fixture did accurate work, and the plates made as I have described were not expensive. W. B. MEHL.



A MICROMETER STOP.

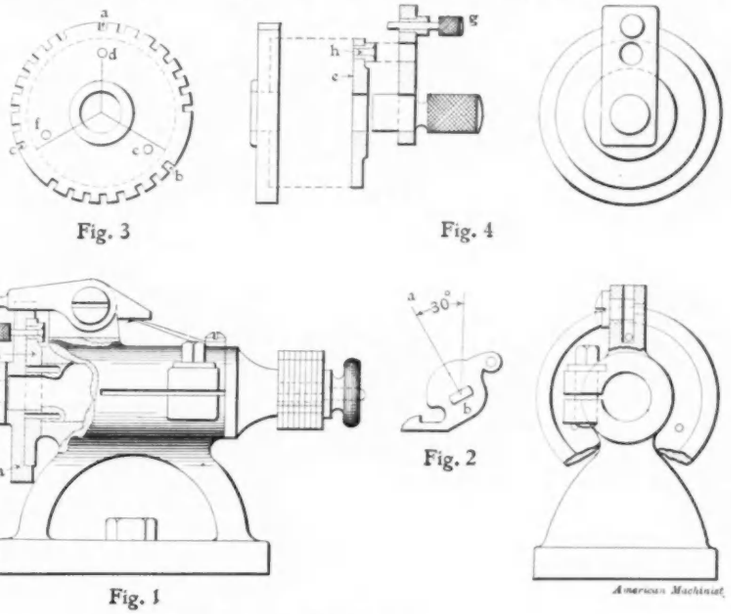


Fig. 3 Fig. 4

Fig. 2

Fig. 1

INDEX PLATE FOR SECTORS.

A Micrometer Stop.

Editor American Machinist:

I have read your paper for a number of years, but never noticed anything in the line of a micrometer stop such as is shown by the enclosed photograph.

Every mechanic knows, when facing a piece of work, how difficult it is to move the lathe carriage just the right amount when there is only a thousandth or two for the finishing cut.

The stop is clamped to the lathe bed at any convenient point and adjusted to abut against carriage, when readings can be taken and the carriage moved accurately any distance within the range of the stop, in this case one inch. It can be used for a variety of work such as recessing an exact depth below a finished surface, stepping from one surface to another by means of a distance piece between stop and carriage, etc.

The other day I had a piece of work on the face-place, and after measuring the location of a hole just bored, it was found to be just one-thousandth out of center. It was but a little work to clamp the stop to the face-plate, take a reading from the side of work, loosen bolts and tap over the right amount by measurement.

I would like to ask, Mr. Editor, how long it might take to adjust that piece of work in position by the usual method of

hitting it "just about right" (?) taking a cut through, measuring over again and then finding that the hole is just a little out of center the other way.

Having made this tool myself and used it in the ways indicated, can say it is a time saver and helps a man to do his work with a minimum of worry.

JOHN KOEHLER.

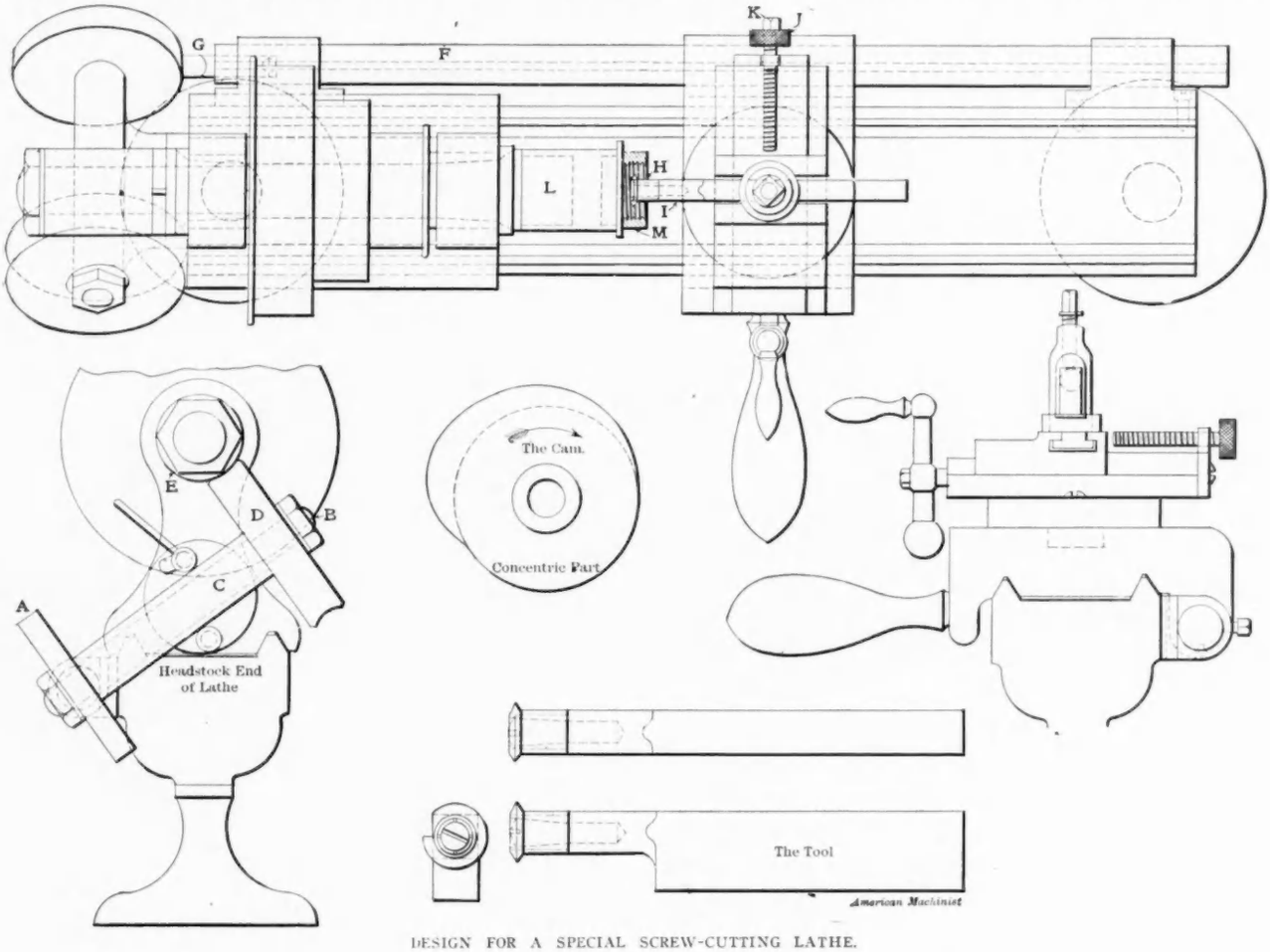
Troy, N. Y.

Design for Special Screw Cutting Lathe.

Editor American Machinist:

The accompanying drawing will show a design for a lathe for cutting short fine threads used on mountings for instrument work. While it is not drawn out in full, there is enough to convey the idea. The drawing shows a piece being cut, which is held in the brass chuck *L* which screws on to the spnidle. Draw-in chucks, solder chucks, etc, etc., are often used, according to which is the most convenient for the job. The spindle is of the regular style for draw-in chucks, with the exception that it is made enough longer at the back end to take on the worm *E*, which engages with the gear *D* which is keyed on to the shaft and is held by bracket *C* which swings on the screw shown, so that gear *D* can be swung out of mesh when not in use. The cam *A* is keyed to the other end of the shaft and the edge of it is worked off spirally to suit whatever pitch is required, with reference to the proportion of the spindle to the speed of the cam. A different cam is provided for each pitch required. The pin *G* is a taper pin fitted into the end of the rod *F* which carries the slide rest, the rod being splined on the under side its whole length, so that the pin *G* will always be in its proper position on the cam while the work is being done.

Let *M* represent the piece to be finished, which is screwed into the chuck *L*. Then the rod *F* is brought forward until the pin *G* comes in contact with the edge of the cone where it is concentric (which will be for quite a distance, unless cutting a long thread, which would use up most of the cam, for which it is not designed) then the slide rest is brought up so that the thread tool *H* just clears the inner shoulder of the work, when the set-screw *K* is tightened. The amount of cut is regulated by set-screw *J*. The lathe runs backwards and the cam pushes the rest backwards. In cutting threads you never can harm the shoulder, for the pin *G* will not allow it to go back any farther than where you first set it, and as it always feeds out there is no danger and you always catch the lead. *I* is the body of the tool used while *H* is the tool, made with a sleeve which fits on the end of *I* which is split into four and is expanded by the taper screw, as seen in the enlarged view, which keeps the sleeve or tool from turning. Care should be taken in working off the face of the cam as on it depends the accuracy of the thread. M. W. LEECH.



DESIGN FOR A SPECIAL SCREW-CUTTING LATHE.

Vacation Observations — Repairing an Old Lathe.

Editor American Machinist:

I took a vacation a while ago—one of the real kind, such as you have urged editorially. Went back to the town where I lived when younger, and strolled by, and rowed on the lake and river where I used to fish and bathe when life had no cares. Spent some time in the old job shop, among the old tools and friends and (I suspect) some of the old chips and grease also. I was particularly interested in the repairing of a lathe by one of my old playmates, now holding a responsible position in the place, and had I not imagined that lathes are never repaired in these prosperous times, but thrown away and replaced, I would have liked to describe the work at the time I saw it. The lathe was very old and the boxes and spindle were worn out and required renewing. My friend made his own pattern, mold and mixture of metal, and,

with the shop forge for a furnace, made the castings for the new boxes. These were planed to fit the headstock and chucked and bored large enough to let a boring bar through, and then put in place. The next operation was to remove the bolts that clamp the headstock to the bed and slide the headstock to the right toward the middle of the lathe. In the place of the headstock he clamped the headstock of a smaller lathe, blocking and lining it up till the point of the center was in line with the tailstock center. No special pains were taken to get the axis of the spindle exactly in line or parallel with the axis of the lathe. As the temporary headstock was simply to drive a boring bar turning on centers between it and the tailstock, the lining of the point of the center only was essential. The headstock under repairs was clamped to the carriage so that it would be drawn along by the feed, and also weighted down to hold it on the ways. A boring bar with a single cutter was put in between the centers and through the boxes to be bored, and as the headstock was drawn along, the boxes were bored straight and, my friend insisted, in line, as the inside ways on which the headstock rested could not be very much worn. Pains were taken to work as near the head end of the lathe as possible.

After putting in a new spindle the lathe faced and bored within the limits of accuracy required. I did not see any reason for adverse criticism, and could but wish that some more modern tools of my acquaintance would do as good work as this old architectural style machine gave evidence of being capable of.

This shop makes a wood-working machine, and is the center of quite a jobbing trade, and I suspect that a good many interesting devices are used, a description of which would make profitable reading. If fortune favors me again with an outing I hope to return again to my old friends, and catch a few fish, and a few ideas also, although only the latter can hope to ever get beyond my personal assimilation.

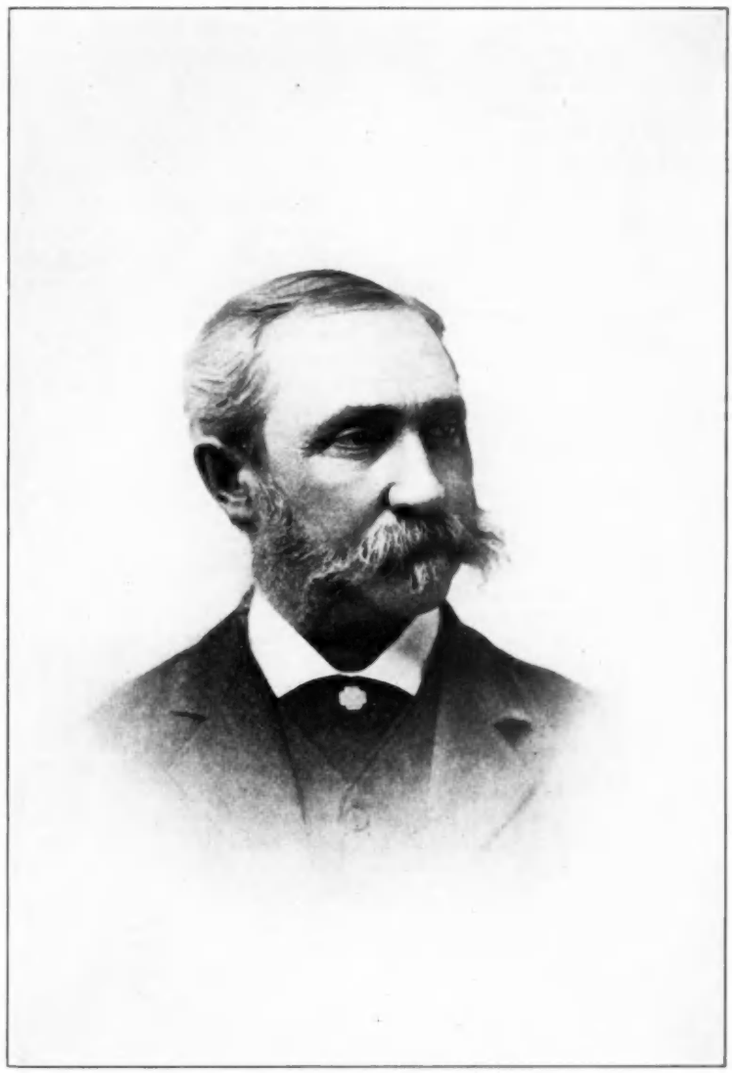
C. E. QUIMBY.

Death of E. G. Parkhurst.

Edward Granville Parkhurst, of Hartford, Conn., died suddenly of heart failure at his summer cottage, Crescent Beach, July 31. Mr. Parkhurst was born at Thompson, Conn., August 29, 1830, and was therefore nearly seventy-one years old at his death. Mr. Parkhurst was one of the best known mechanics in America, and his inventions, though of a character not appreciated by the general public, have done, and still are doing, very much to render modern manufacturing processes efficient. Among the most important of these perhaps is the wire or rod feed for screw machines, now almost universally used on both hand and automatic machines. By this device the movement of a lever in one direction opens the chuck and moving it in the reverse direction feeds the stock forward and again closes the chuck, this being done without stopping the machine. He also made many improvements in small arms and machine guns and had an extensive acquaintance among army and navy men all over the world. During the Civil War Mr. Parkhurst was connected with the Savage Arms Company, of Middletown, then a famous small-arms concern. In 1869 he went to Hartford and entered the employ of Pratt & Whitney, affording better opportunity for the exercise of his inventive talents and mechanical genius. He was an expert draftsman, and many of the productions of the Pratt & Whitney Company were of his invention or were worked out by him. He soon became prominent in the company's affairs and for several years was assistant superintendent of the works. Mr. Parkhurst remained in the company's employ until about six years ago, when during one of the reorganizations of the company he retired. For a few years he was connected with the American Ordnance Company, of Bridgeport, but more recently had held a responsible position with the Bethlehem Steel Company, of South Bethlehem, Pa., though he retained his residence at No. 50 Sumner street, Hartford.

During his connection with the Pratt & Whitney Company Mr. Parkhurst invented a number of machines connected with the manufacture of rapid-fire guns and heavy ordnance. When the Hotchkiss gun was made at that factory, and later when the Gardner gun was produced there, Mr. Parkhurst was at the head of the special department where those were produced. Quick-firing guns were his specialty, and his ability as an expert in that line was recognized far and wide.

His latest invention was a clip which carries five cartridges, for attachment to the Krag-Jorgensen rifle, converting it into a magazine repeating rifle. The clip enables the rifle to be supplied with cartridges much faster than by its own



E. G. PARKHURST.

mechanism, and as the rifle is now in use by the United States army, the value of Mr. Parkhurst's invention was soon recognized. There was considerable opposition in certain army circles to the adoption of the clip, but Mr. Parkhurst was able to secure an order for the equipment of a portion of the army in the Philippines with the invention for use in the field, the most practical test of its efficiency. It is expected by those most familiar with the invention that it will finally be adopted for use in the United States army.

Mr. Parkhurst was quite musical in his tastes and delighted in the society of musical people. In early life he indulged his musical tastes to a considerable extent. Though possessed of considerable literary talent, he was never prevailed upon to write for publication until within the past few years, when he contributed some articles to the "American Machinist," which were highly appreciated. He had promised to write more of such articles, and we hope that some of them will be found among his papers.

Mr. Parkhurst was a very genial, companionable man and was generous and hospitable. He had a great many friends who always enjoyed meeting him, because of his genial personality and wholesouled manner of welcome and greeting, as well as because he was in the habit of saying things when he talked. Mr. Parkhurst was a charter member of the American Society of Mechanical Engineers. He took deep interest in public affairs and served the city of Hartford as member of council and as alderman. He leaves a widow and a married daughter.

Obituary.

James S. McKee died in Parkersburg, W. Va., on the 7th inst. He was born in Ireland in 1814 and came to this country when about 18 years of age, first locating at Pittsburgh, where he built up quite a business in the building and equipment of boats and became very well known along the river. It is claimed that he was the inventor of the adjustable die for cutting threads. This it is claimed he did while engaged on a bridge contract on which he was obliged to use many different sizes of bolts and he constructed adjustable dies to enable him to thread all the different sizes with one pair of dies.

It is suggested that there would be welcomed in the trade a steel tape with marks 3.1416 inches apart. The tape would be useful in measuring wheels or rolls of large diameter. The tape applied around the outside would thus give the diameter in inches, and those who have used a steel tape for such measuring say that it gives very accurate and reliable results.

Beauty as the Average Molder Sees it.

In a chat with one of our traveling officers on the beauties of the foundries, I will give you the benefit of his experience. My attention has been called by foundry proprietors to the nice grounds surrounding the shop, to the flowering plants, green grass, and flowing fountains, which the men could feast their eyes upon.

A peculiarity connected with each of these occasions, he says, is that in every case it happens that the molders have made a demand for better wages and the proprietor in his anxiety to point out how much more considerate he is of his workmen's comfort than his neighbor is, forgets that his molders do not have time to gaze upon these things the same as he; who, should it happen, caught a workman idly admiring these things, no doubt would censure him. I very much doubt if one-tenth of our fellow workmen could tell a visitor what kind of plants were growing in front of his window. With the sweat running in his eyes and mixing with the parting sand and black lead already there, a geranium must look as picturesque to his eye as a bunch of slag.

I trust that no one will think me a hater of clean shops or nice surroundings; on the contrary, I appreciate them; but when it comes as an excuse to keep wages lower than in other shops, for my part give me the wage and cut out Edenic surroundings. I can buy a geranium for fifteen cents, and look at it the whole year while they charge me dollars for a privilege I don't want. Give me the chance to provide a little green grass and flowering plants in front of my home, and I promise that during my leisure moments, when the sand has been washed out of my eyes, to try and be as ardent an admirer of horticultural beauty as those who have more time than I. We can all stroll around on Sundays and admire beauty of this kind in some nice lawn or flower garden belonging to someone more fortunate than we. But what we want is a chance to admire some of these beautifying things with a knowledge that we own them. Or is this asking too much for a workman?—CHRONIC CRANK, No. 241, in "Iron Molders' Journal."

Manufacturers.

Fleischmann & Co., Cincinnati, O., will build a $250,000 elevator.

A. W. Gifford, of Worcester, Mass., will erect a large factory building there.

An addition will be made to the woolen mill of Samuel Fox's Sons, La Porte, Ind.

Albert Russell & Sons, of Newburyport, Mass., will put up an addition to their foundry.

A factory is being built for the Cleveland Machinery & Manufacturing Company, Cleveland, O.

It is rumored that the Brooks Locomotive Works at Dunkirk, N. Y., will build a steel foundry.

P. S. Daubenspeck and C. O. Patton, of Milroy, will erect a large grain elevator at Gaston, Ind.

The Keystone Shade Roller Company, of Saginaw, Mich., will build a large plant at West Pullman, Ill.

The Pike Manufacturing Company, at Pike's Station, N. H., is building an addition to its scythe stone mill.

Dr. G. H. Baker will build a three-story addition, 50x77 feet, to his Bernon street mill at Woonsocket, R. I.

N. G. Carpenter, Thomas H. Galvin and J. F. Sunderland will put up a woolen mill at East Greenwich, R. I.

The name of the Shugers Gasoline Engine Works, Coldwater, Mich., has been changed to Regal Gasoline Engine Company.

The Illinois Steel Company is about to begin the construction of a cement storage elevator at its works in South Chicago.

The American Tin Plate Company will double the productive capacity of its National Works, located at Monessen, Pa.

(*Continued on next page.*)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant: see p. 22.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Shafting straighteners. J.H.Wells,Tampa,Fla.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Solden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

See 12 presses & dies for sheet-metals, S. E. cor. Machinery Hall, Buffalo Exposition. Ferracute Mch. Co., Bridgeton, N. J.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, cut light gears, cams and duplicate small machine parts, in quantities.

Planer and shaper wanted by Petersburg Iron Works Co., Petersburg, Va.; second hand, medium size; write fully and send cut with price. Box 403, AMER. MACHINIST.

Machinery built by contract; modern equipment and organization; accurate work; prompt delivery; low prices; weights up to 5 tons. The Blanchard Machine Co., Boston.

Gear and Milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

Wanted—A new or second-hand lathe (second-hand, in good order, preferred), 24 in. swing, to handle shafting 12 ft. long. Address, with full particulars and lowest price, The Montreal Cotton Co., Valleyfield, P. Q., Canada.

Purchaser for small manufacturing plant; lot, 100x180 feet; machine shop, 32x68, two story, with line shaft and gasoline power; foundry, 40x54, new modern equipment; good location; for sale cheap. Hart-Parr Co., Madison, Wis.

Two hand-colored tempering charts (A and B), 36 steel working receipts and free sample of Monarch Welding Compound, all for $1; these cover all difficult steel working; invaluable to machinists. W. M. Toy, Sidney, Ohio (40 years a steel worker).

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Mechanical and civil engineer, well connected in Europe, desires to represent permanently a full line of improved milling machinery in Germany, Austria and Russia especially; correspondence solicited. Engineer, P. O. Box 718, New York.

An expert mechanic and engineer, who has some patented specialties for automobiles, desires to make arrangement with a good firm who wants to take up a line of goods for which the demand is very brisk and increasing at a rapid rate; must be financially able

to carry some stock. Address "Engineer," care AMERICAN MACHINIST.

Wanted—Partner with capital, to start foundry and machine shop; opportunity for lucrative business for broad-gage man, possessing mental comprehension, integrity and capital, who dares enter the manufacturing field; first-class work; saleable articles. Address "Experienced Mechanic," Box 395, AMERICAN MACHINIST. Brokers and timid men requested not to answer.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman wishes position. Address Box 400, AMERICAN MACHINIST.

Mechanical draftsman, experienced designer of special machinery, desires position near city. Box 398, AMERICAN MACHINIST.

Mechanical draftsman, age 25, technical school graduate, 6 years' office and shop experience, wants position. Box 397, AM. M.

As foreman in machine or brass shop, by first-class, all-around machinist; 20 years' experience; good references. Box 389, AM. M.

Designer and draftsman; 10 years' practical experience on special machinery, machine tools, jigs and fixtures. Box 390, AM. MACH.

Designer of machine tools and jigs, now holding responsible position, desires to change; can show first-class record. Box 399, AM. M.

Superintendent, with 20 years' experience in light metal manufacturing by most approved modern methods, wishes to make a change. Box 250, AMERICAN MACHINIST.

A designing draftsman, with technical education and extensive practical experience on metal-working machinery, etc., wants a Western position. Address "Pitts Burg," care A. M.

Young man, 13 years' assistant manager large factory, desires executive position; clean record; highest character; fine references. "F," 32 Union Trust Building, Indianapolis, Ind.

Mechanical draftsman, 12 years' practical experience, light and heavy machinery, capable to assist chief draftsman or superintendent, desires permanent position. Box 391, AMERICAN MACHINIST.

Mechanical engineer, technically educated, experienced designer of plants and machinery, desires responsible position designing or superintending erection; first-class references. Box 392, AMERICAN MACHINIST.

Designing draftsman, 17 years' experience on marine and stationary engines, general and special machinery with leading firms, is open to engagement September 1; New York or vicinity preferred. Address Box 377, AM. M.

Practical mechanic, 35, now employed as assistant superintendent of large manufacturing establishment, desires similar position with concern whose works are at least 50 miles from sea coast and on high ground; good reason for change; correspondence solicited. Box 402, AMERICAN MACHINIST.

General superintendent, energetic American, who understands his business from A to Z, would appreciate a position where there is something to do; prefers work to snaps; can organize a machine plant so as to minimize cost and give a reason why. Parties requiring an up-to-date man with plenty of push, practical experience and technical education, will find him at Box 401, AMER. MACHINIST.

Help Wanted.

Wanted—First-class patternmakers at the Reeves Machine Co., Trenton, N. J.

Wanted—First-class machinists. U. S. Long Distance Automobile Co., 307 Whiton st., Jersey City, N. J.

Wanted—Good machinists, lathe and planer hands; first-class opportunity. Apply by letter to Box 388, AMERICAN MACHINIST.

Wanted—Machinists; two floor hands, one good boring and turning mill man. Address Northern Engineering Works, Detroit, Mich.

Wanted—Two first-class machinists to work in job shop; steady work at good wages. Fairmont Coal Co., Fairmont, W. Va.

Wanted—First-class metal patternmakers and machinists; state experience and references. Address Box 373, AMER. MACHINIST.

Wanted—First-class draftsman, accustomed to gun and bicycle tools and fixtures; also a good detailer. Address "Q," care A. M.

Machinists wanted at San Francisco; wages $3.50 per day; bonus of 50c. additional per day for one year of satisfactory service. Box 370, AMERICAN MACHINIST.

Good patternmakers, both wood and metal, desiring steady employment, will find it to their advantage to apply to the General Electric Co., Schenectady, N. Y.

Wanted—Iron and brass foundry foremen; capable of handling men to advantage; understands molding machines and mixing metal. Address Box 372, AMERICAN MACHINIST.

Wanted—Good machinists to work in open shop at Detroit, Mich.; permanent employment and good pay for competent and steady men. Address R., care AMER. MACHINIST.

We invite applications from machinists and molders; give references, experience and wages expected; work on air compressors. Franklin Air Compressor Co., Franklin, Pa.

Young, competent patternmaker, as instructor in college in Louisiana; graduate of school preferred; salary $600 first year. Prof. Harry Gwinner, Canton, Mississippi.

A large New York factory requires the services of a few mechanical draftsmen for intricate work; state age, experience and salary; permanent positions. Box 381, AM. M.

Wanted—For out-of-town position, a thoroughly competent mechanical draftsman; state experience fully and salary required, together with references. Box 394, AM. MACH.

Two good mechanical draftsmen for work on electrical apparatus; a good chance for a worker to make a permanent position in a large Chicago factory. Box 407, AM. MACH.

Machinists.—Two or three good, all-round machinists for shop building slide valve engines; location Western Pennsylvania. Address, stating age and experience, Box 357, AMERICAN MACHINIST.

Wanted—Working foreman for turret department, to take charge of ten turret and screw machines; state experience, wages expected and references. The Bickford Drill & Tool Co., Cincinnati, Ohio.

Wanted—A first-class draftsman with experience on high-grade engine work; give particulars of experience, salary expected, references and state how soon could come. Box 405, AMERICAN MACHINIST.

Wanted—Draftsmen experienced in structural and mechanical work; good salaries and permanent position to the right men; give record, stating experience and salary expected. Box 347, AMERICAN MACHINIST.

Man who thoroughly understands brass polishing and nickel plating wanted to take charge of a small plant in the country near New York. Address, giving wages expected, references and experience, Box 396, AM. M.

Blacksmiths.—Two good general machine blacksmiths for machine shop near Pittsburgh, Pa.; good wages and steady work will be given to competent men. Address, stating age and experience, Box 358, AMER. MACHINIST.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—Brooklyn, young machinist for general work; must be first-class lathe hand, and had 2 years' vise work; good opening for ambitious man; give full experience, nationality and wages expected. Address Box 404, AMERICAN MACHINIST.

Wanted—An experienced manager and mechanical engineer accustomed to up-to-date methods for producing small and medium machine work of best quality and cheaply; salary and best of references required. Address Box 346, AMERICAN MACHINIST.

Foundry foreman wanted in shop employing about 30 men on structural and general foundry work. Address P. O. Box 121, Lafayette, Ind. State present employment, wages expected and send letters of recommendation from past employers.

Wanted—Estimater and designer; must be fairly well up in sheet metal work, principally brass; must be able to design tools and make his own drawings; to an able and wide-awake man a permanent position can be assured. Address, giving particulars, Box 371, AM. M.

Wanted—Iron foundry foreman; one familiar with iron valves and fittings; must understand molding machinery, and capable of handling men to best advantage; foundry employing about 25 bench, 15 floor and 25 machine molders. Address Box 359, AM. MACH.

Draftsman wanted; must have general

(*Continued on next page.*)

(*Continued from preceding page.*)

The first steel car building plant in the South is being erected at Ensley, Ala. When finished it will give employment to 1,200 men.

The Get Averall Company will be removed from Greenville, O., to Richmond, Ind., and a new factory building will be put up for its occupancy.

It is reported that the Knoxville Iron Company will move its rolling mills to Knoxville, Tenn., from Harriman and thus consolidate the plants.

The Anglo-American Provision Company, Chicago, is building a new power plant. The engine-house will be 3-x88 feet, and the boiler-house 35x56 feet.

Trouble is threatened between the carriage makers and the manufacturers at Cincinnati, O., which may culminate in the organization of a large co-operative plant.

Inspector Kipp has granted a permit to the Alexander Smith & Sons Carpet Company, of Yonkers, N. Y., for a brick building for manufacturing purposes.

Goyne Bros., of Wilkesbarre, Pa., have bought the Garner machine shops at Ashland from the Garner estate. They intend to erect an addition to the works.

Rushton Cotton Mills, Griffin, Ga., reported as to double plant, and will erect a 146-foot addition and install 6,000 spindles and 18 looms at a cost of $65,000.

Fire destroyed the Eclipse Machine Works and a portion of the works of the Atlas Parlor Furniture Company, at 1132 West Fourteenth street, Chicago, on the 10th.

It is reported that if the steel trust dismantles its plant at McKeesport, Pa., as it has threatened to do, citizens of that place will build a better one in its place.

It is reported that the National Malleable Steel Casting Company, Sharon, Pa., will double the capacity of its works and increase to 1,200 the number of men employed.

The McNally Oil Manufacturing Company has bought for $8,000 a site at Berkley, Va., and will erect a plant to cost $30,000 to make oil from castor beans and linseed.

The Dunn Worsted Mills Corporation, of Woonsocket, R. I., manufacturer of woolens and worsteds, has the plans drawn for a new 50-loom plant on a site near its present mill.

A $65,000 factory will be built at the northeast corner of Sixteenth and Arch streets, Philadelphia, by Stephen Greene. The building will be seven stories high, and it will measure 37x106 feet.

Plans have been completed for a boiler shop for the Chris Pfeiffer Boiler Company, to be built at 68 Michigan street, Chicago. The principal building will be one story, 32x100 feet, and will cost $8,000.

The Crawford Woolen Mills at Brucetown, Va., with branch plants at Martinsburg, W. Va., and Winchester, will increase their capacity to double its present size, and will also double the force of employees.

Foley Bros., Olean, N. Y., will move their marble and granite works to a new site at that place and put in a pneumatic traveling crane, a 60 horse-power gas engine and new sawing, countersinking and molding machines.

The merchants of Kenosha, Wis., are indignant at the Electric Light Company for raising the rates 50 per cent. and say they will form a company of their own and build an electric plant to compete with the local company.

Work has been commenced on a new mill at Woonsocket, R. I., to be erected by Dr. G. H. Baker, proprietor of the Leicester Knit-

ting Mill. The Dunn Worsted Mills and the Loridans Worsted Company are expected also to erect new buildings.

Steele & Sons are taking estimates on a new glass manufacturing plant to be erected at Holmesburg Junction, Pa., for the E. A. Gillinder Glass Company. The building will be of brick, mill construction, three stories high, and will measure 250x80 feet.

Agent Latimer Willis Ballou, recently in response to inquiries by a reporter stated that the Guerin Spinning Company, Woonsocket, R. I., will probably add to its plant this fall by erecting a three-story brick mill in which the preparing machinery will be located.

A large paper mill will be erected at Carthage, O. (near Cincinnati), and C. M. Beech, who is connected with the Chatfield & Woods Paper Company, is in charge of the work, though he declines to say who the parties are that are behind the enterprise.

The National Pulp Company, of New Brunswick, N. J., has invited bids for the erection of six brick factory buildings in East New Brunswick. The New Brunswick Refrigerating Company has let contracts for the erection of a new plant to cost $50,000.

W. A. Sparger & Co. will erect a large roller-process flouring mill on Commonwealth avenue, Bristol, Va. The mill will be a four-story building, will have an elevator capacity of 20,000 bushels, and a daily capacity of 200 barrels of flour and 1,000 bushels of meal.

Wendnagel & Co., manufacturers of water tanks and tubs, are going ahead with the construction of a three-story factory at 829 to 835 South Jefferson street, Chicago. There will be an engine and boiler house, two stories, 20x96 feet. The buildings will cost $40,000.

Oliver Brothers, Lockport, N. Y., will enlarge its plant. The firm contemplates adding an additional story to the Gooding street front of its main building. This will enable the company to operate about 175 polishing machines and will afford employment for fifty additional men.

Under the patronage of the Board of Trade, Altoona, Pa., is to have a $35,000 foundry, built and operated by local capital. John P. Levan, B. M. Bunker, M. V. Orner, H. K. McCauley and John A. Doyle are directors, Levan is president and Bunker secretary and treasurer.

Wyman & Gordon, drop forgers, are to build another addition to their plant on Bradley street, Worcester, Mass. A permit was given the company recently to erect a wooden addition, 80x25 feet, one story high; the cost not given. The new structure will be used as a forge shop.

A permit has been issued to George E. Payne & Co. for the erection of a seven-story factory building at the northeast corner of Sixteenth and Arch streets, Philadelphia, Pa., for the Stephen Green Company. The building will be of brick, 37x106 feet in dimensions and will cost $65,000.

The Alexandria (Va.) Hosiery Company has been organized and the capital stock of $10,000 subscribed. The officers of the company are William Schwarzman, president; Arthur Schwarzman, vice-president; John Schwarzman, treasurer; Samuel Stokely, secretary and general superintendent.

R. B. Starbuck, superintendent of the Peoria division of the Illinois Central, and his son Charles, an engineer on the same road, have completed arrangements for the erection of a factory in Mattoon, Ill., for the manufacture of their child's hand car on which they have just received patents.

The Whittaker & Weber Company will erect a factory building at 5223 North Second

(*Continued on next page.*)

Help Wanted—Continued.

knowledge of shop methods and be capable of designing light machinery, under instruction; a permanent position is open for the right man, in a small shop running on high-grade specialties. Address, giving full particulars, Box 393, AMERICAN MACHINIST.

Wanted—A foreman for pattern shop in architectural iron works, capable of handling 10 to 15 men; must be thoroughly familiar with all kinds of iron stair work and ornamental iron work and in buildings; position permanent to the right man. Address Jas. McKinney & Son, Albany, N. Y.

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